

Friday Morning Session (09:30-11:30)

The neural basis of social perception and understanding.

Tjeerd Jellema, Utrecht University.

Social scenes usually contain complex stimulus configurations, derived from the postures and actions of one or more agents. A description of the social scene can be made at two successive levels. At the first level, a literal, mechanistic, description is made in terms of causes and consequences of goal-directed actions. At the second level, a mentalistic description is made, in terms of the mental states and intentions of the agents. The latter involves associations with emotional values and memories, and possibly the recruitment of mirror-neuron systems, resulting in a meaningful interpretation. A number of distinct visual cues have to be taken into account to accomplish the mechanistic, or perceptual, description. These include: (1) Form: e.g. the perspective view at which the agents are seen. (2) Motion: the articulated, or whole body, actions performed by the agents. (3) Spatial location: the relative positions of the agents with respect to each other and objects. (4) Immediate perceptual history: actions usually consist of sequences of motions/postures.

Cells in the anterior part of the superior temporal sulcus (STSa) of the macaque monkey are selectively responsive to one or more of these four visual cues, or to intricate interactions between them. Therefore, the STSa seems well equipped to represent a social scene at the perceptual level. Next, concerted activity of the STS with e.g. the amygdala, cingulate cortex and orbitofrontal cortex may form the basis of the second, interpretation, level.

The findings from the single cell studies have directed our thinking about what the components and neural underpinnings of social cognition are, and have guided the design of behavioural experiments. In the latter experiments a perceptual distance-judgment task was used to measure quantitatively the extent to which social stimuli are processed automatically at the interpretation level by autistic and typical participants. The judgments of typical participants were biased by the implications of the social stimuli, while the autistic participants remained unaffected. This suggests that the semantic processing of social stimuli in autistic people is not automated.

When and how do we perceive the biological motion? : An event-related potentials approach.

Masahiro Hirai, The University of Tokyo.

Biological motion (BM) is well known and interesting phenomenon that we can get vivid impression of human figure just from only moving point-lights. Recently, it is discussed in the context of social perception (e.g. Blake et al., 2002). As supporting this notion, neuroimaging studies have revealed that the responsible area for the BM perception was same as other social perception (e.g. gaze direction). However, there remain several questions for neural substrates of the BM perception: (Q1) How does our brain process the BM? (Q2) When does our brain begin to process the BM?

Firstly, to reveal the neural dynamics involved in the BM perception (Q1), event-related potentials (ERPs) were recorded from twelve healthy adults. Participants were shown BM or scrambled motion (SM) as a control stimulus. In the SM, each point had the same velocity vector as in the BM, but the initial starting positions were randomized. The perception of both stimuli elicited negative peaks at around 200 (N200) and 240 ms (N240).

Furthermore, both negative peaks were significantly larger in the BM condition than in the SM condition over the right occipitotemporal region.

Secondly, to clarify the way of processing for the BM perception (Q1), the attentional effect was investigated. Participants observed BM or SM that was overlaid with noise (ten randomly moving dots) and four rectangles (one of which was/was not rotated 90° relative to the others). They were required to direct their attention to one of two features of the visual stimulus, namely the type of motion (BM or SM; attention-to-motion condition) or the rotational angle of the overlaid rectangles (attention-to-rectangle condition). As above result, the ERPs had two negative components at ~200 ms (N200) and ~330 ms (N330) in both attentional conditions. The result showed that the amplitude of N330 in response to BM was greater in the attention-to-motion condition than in the attention-to-rectangle condition, and was greater than the amplitude of the response to SM in the attention-to-motion condition.

Finally, to investigate the BM perception from developmental point of view (Q2), 6- and 8-month-old infants were measured ERPs during the perception of BM or SM. The activation of the right hemisphere in 8-month-old infants was similar to that of adults.

These results suggest that the BM is 1) processed in 200-300ms at the right occipitotemporal region 2) affected by attention (top-down manner) in this experimental condition 3) processed at around 8 month of age.

Perceiving one's own movement with delayed visual feedback

Sotaro Shimada and Kazuo Hiraki, The University of Tokyo.

How can you recognize an image of an arm as your own arm? We consider that co-occurrence of proprioceptive and visual feedback is crucial in this process. The parietal cortex has often been considered to be the region where proprioceptive and visual information of one's own body are integrated. In this study, we investigated the parietal cortical activity during a visual-proprioceptive synchrony judgment task in which visual feedback of passively moving one's hand was delayed. Twelve subjects (one female and eleven males, 18-28 years old) participated. The subject's right hand was placed on a turntable that rotated approximately 36 degrees / s electrically. Visual feedback of subject's hand was delayed (86-319 ms, at 33 ms intervals). The subject judged whether there was a delay between proprioceptive and visual feedback or not. The parietal cortical activity was measured by a 48-channel near-infrared spectroscopy (NIRS) apparatus (OMM-2000, Shimadzu). The activity of the parietal area appeared to be modulated by the length of delay between proprioceptive and visual feedback. The threshold of delay for the synchrony judgment (50% point) was about 190 ms. Several channels located on the inferior parietal region showed the tendency that the degree of NIRS responses reached the largest around at the 186-ms delay condition and decreased gradually as the delay becomes longer or shorter in both hemispheres. These results demonstrate that the activity in the inferior parietal cortex was modulated by the delay between proprioceptive and visual feedback of passively moving one's own hand and was consistent with subjective judgment. We suppose that the inferior parietal cortex is essential for integrating proprioceptive and visual information to distinguish one's own body from others.

Friday Early Afternoon Session (13:00-15:00)

Functional neuroimaging studies of action-perception matching in typical development and autistic spectrum disorder.

Justin H G Williams, Aberdeen University.

I will present the findings of two separate neuroimaging studies that have used fMRI to identify the neural substrate of imitation and joint attention. In the first study we administered an imitation paradigm to 16 male adolescents with autistic spectrum disorder, and 15 controls matched for age, IQ and sex. We found that during imitation the controls, unlike the ASD group, showed greater activation in posterior brain areas previously associated with mental state attribution. ASD subjects showed greater activation of parahippocampal areas. We conclude that even very simple imitation utilises brain areas associated with mental state attribution. Additionally, during imitation, these and other areas undergo modulation that is absent when observation and execution occur separately. In a second independent study, we examined the neural substrate of shared attention, which we have conceptualised previously as the matching of perceived and enacted attentional direction. A series of video clips was made where the model in the clip was seen to be either looking at a moving red dot or looking elsewhere, but with an equal number of gaze shifts. Subjects were asked to watch the moving dot. In one series of clips this generated a shared attention condition, which could be contrasted with the non-shared attention condition generated by the other series. The shared attention condition resulted in greater activation of medial frontal cortex, the left frontal pole and other areas serving executive function. This is evidence that joint attention processes do indeed form the cognitive precursors of theory of mind function, in areas serving the matching of perceived and enacted relationships between object and eye gaze. These influence the development of attentional and possibly motivational regulatory systems, the dysfunction of which may explain the inflexible patterns of behaviour, and interests devoid of social content, that characterise autism.

The self- and other-processing in verbal children with PDD: Effects of self- and other-action on episodic memory.

Yukiko Yamamoto, National Institute for Physiological Sciences.

To explore the self-, and other-processing in autism, verbal PDD children (n = 16) and mental age (MA) matched group typically developing (n = 14) and mentally retarded children (n = 10) were examined using the subject-performed task (SPT) and the experimenter-performed task (EPT). To assess the effect of self-action, the memory performance after the SPT, and EPT was compared with memory performance of the verbal task with no action cues as baseline. Results showed that the SPT effect was almost the same degree of the EPT effect for the PDD group, whereas the SPT effect was superior to the EPT effect for the two MA matched control groups indicative of the uniqueness of self-processing. These findings point to an atypical nature of self-consciousness that is characteristic of autism.

Imitation-related visuomotor integration: ERP and behavioral studies.

Hirokata Fukushima and Kazuo Hiraki, The University of Tokyo.

Motor imitation is considered to be an important basis of social cognition. We have been investigating neural activity inherent to imitation using event-related potential (ERP), which has almost never been applied to imitation studies. Here we will report the imitation-related ERPs elicited in a couple of imitative reaction time (RT) tasks, as well as a strong task-dependency of those patterns.

Firstly, we examined ERPs of subjects who were required a quick button-pressing in reaction to another person pressing a button in front of them. This reaction was executed both in left and right hand in a mirror-like configuration, and it was considered 'imitative' given that the cueing and responding motions (button press) were equivalent. Compared with reactions to a non-human cue (alternation of LED illuminations), the surface topography in the imitative reaction was characterized by a negative component. This component was generated around the pre-central region contralateral to the response hand, with a latency of 130 - 200 ms post cueing. This pattern suggests that imitative action elicits dominant motor-related processing during information transfer from visual to motor areas.

In following experiments, apparent motions (or pseudo-movies) of finger movements on a CRT are employed as visual cues, to control stimulus timings for much precise examinations of RTs and ERP latencies. However in these setups, the differences in ERPs between imitative and non-imitative conditions were highly diminished. Moreover ERP topographies appeared dependent on stimulus properties and contents, such as smoothness of motion or direction of finger movements.

Together with these ERP data, we will also report confusing results found in RTs. Former behavioral studies of imitation have revealed that the imitative reaction is released faster than an identical but non-imitative visually cued action. However, the results of my paradigms showed RTs in the imitative reaction was not shorter, or sometimes even longer, than that of control conditions. A similar conflict with former studies was also observed in terms of goal-directedness of imitation, that is, the notion that the presence of a goal in an imitated action facilitates its imitation. In some subjects RTs were prolonged when a dot was added as a goal of imitated finger movement. These ERP and behavioral results are discussed in a frame of visuomotor information transfer.

Friday Late Afternoon Session (15:30-17:30)

Facial emotional perception during normal and autistic children.

Magali Batty, Université Paul Sabatier.

The human face is a source of easily accessible information from which we can deduce the mood of people with a simple glance. This ability is present very early in normal development although it continues to improve until adulthood. However, this aptitude is often absent in autistic children, and in large part responsible for their difficulties in integrating socially. The present study investigated the underlying processes of facial emotional perception in adults, children and autistic children.

In adults, the early ERP components (P1 and N170) showed emotional effects even without directed attention, showing that the emotional processing was very rapid (90 to 150 ms after stimulus presentation) and automatic. These results were also confirmed by MEG data. Source analyses confirmed the distinctive activations for the different emotions. Sex differences appeared only in processing explicitly emotional faces.

In normal childhood, the development of the components measured extends over a long period. These protracted changes suggest that the analysis of emotions is modified on an ongoing basis until adulthood. The only effect seen in adults that was found in children was the N170 amplitude effect of emotions in the 14-15 year olds. The processing of the basic emotions in adolescence resembled that of adults, but the mature pattern was not yet achieved. However, young children (4-7 years old) showed an effect of emotion on P1, suggesting global emotional processing during the first part of childhood which fades or is obscured by other processes, with age.

Children with autism also showed changes in ERPs with age, although the emotional processing found in normal adults did not appear even in the oldest autistic children. In contrast, the P1 emotional effect found in young children without autism was present in the children with autism and did not change with development.

Neural and psychological mechanisms for processing of dynamic facial expressions of emotion.

Wataru Sato, Kyoto University.

Dynamic facial expressions of emotion constitute natural and powerful media in day-to-day interaction. However, little is known about the neural and psychological mechanism for processing of dynamic facial expressions of emotion. We depicted the brain areas by using fMRI with twenty-two right-handed healthy subjects. The facial expressions are dynamically morphed from neutral to fearful or happy expressions. Two types of control stimuli were presented: (i) static facial expressions, which provided sustained fearful or happy expressions, and (ii) dynamic mosaic images, which provided dynamic information with no facial features. Subjects passively viewed these stimuli. The left amygdala was highly activated in response to dynamic facial expressions relative to both control stimuli in the case of fearful expressions, but not in the case of happy expressions. The right ventral premotor cortex showed higher activation during viewing of the dynamic facial expressions than it did during the viewing of either control stimulus, common to both expressions. In the same manner, the broad region of the occipital and temporal cortices was also activated. Based on this neuroscientific evidence, we hypothesized

that the psychological processing for dynamic facial expressions would have at least two specific characteristics compared with the processing for static expressions: (i) when subjects view dynamic facial expressions, they experience stronger emotions from faces than when they are observing static faces; (ii) the observation of other's dynamic facial expressions induces the perceiver's spontaneous facial motor responses more evidently than the observation of static expressions. The results of our psychological studies supported these hypotheses. These results suggest that the processing system of dynamic facial expressions of emotion includes the elicitation of own emotion and motion as important components.

Modularity of facial expression recognition: Differential psychology approach.

Atsunobu Suzuki, The University of Tokyo.

A controversial issue concerning facial expression recognition is the interrelationship between recognition of different basic emotions (surprise, fear, anger, disgust, sadness, happiness). Neuropsychological research has reported that focal brain damage causes disproportionate impairment in recognizing facial expressions of a specific emotion, especially fear (Adolphs, Tranel, Damasio, & Damasio. (1994). *Nature*, 372, 669-672.) or disgust (Sprenkelmeyer et al. (1996). *Brain*, 119, 1647-1665.), suggesting neural substrates that are specialized in recognizing certain emotions. Somewhat moderate differentiation such as between positive (happy) emotions and negative (unhappy) emotions is also indicated by broader recognition deficit except for happiness (Adolphs, Tranel, & Damasio. (2003). *Brain & Cognition*, 52, 61-69.). These previous reports, however, have been criticized for lacking control over differing recognition difficulty across emotions in their assessment of facial expression recognition (Rapcsak et al. (2000). *Neurology*, 54, 575-581.). Critics argue that apparently emotion-specific impairments are mere artifacts that are due to such differential difficulties. To address the issue, colleagues and I propose a new method that is designed to measure individual differences in recognizing emotional facial expressions as sensitivities to basic emotions in faces. In order to obtain facial expression stimuli with various levels of difficulty, the current method utilizes ambiguous facial expression stimuli created by morphing technique. In addition, a refined psychometric method of item response theory (IRT) enables us to estimate sensitivities comprising different levels of difficulty across stimuli. Results confirmed that estimated scores of sensitivities varied substantially among individuals, and that they were reliable measures with internal consistency. Most intriguingly, we found that sensitivities to five emotions other than happiness were all positively correlated, but sensitivity to happiness was not correlated with sensitivity to any other emotion. Our findings indicate that independence of happiness recognition is not simply due to overall ease of happiness recognition, indicating separable systems dedicated to the recognition of positive emotions or negative emotions.

Saturday Morning Session (09:30-11:30)

Autism and the social brain: Taking the recent findings at face value.

Chris Ashwin, Cambridge University.

Certain areas of the brain are key to processing social information. These brain areas are associated with cognitive mechanisms important for human survival and well-being. These cognitive mechanisms include such processes as threat detection, gaze perception, face and emotional expression processing.

Autism is a neuropsychiatric condition characterised by severe social and communication deficits. These problems include difficulties in relationships with others, perceiving non-verbal aspects of communication, and emotion expression and perception. Although autism is generally understood to have a brain basis, this basis is still poorly understood. Given the significance of social deficits in autism, there has been a recent surge of research into social cognition. These findings have generally emphasized autism to be a condition characterised by a lack of normal social processing capabilities, at both the neural and cognitive level.

I will summarise recent neural and cognitive findings from studies in our lab of various social-emotional tasks and people with and without autism. These tasks involve fMRI and behavioural studies investigating the processing of faces, emotional expressions, and gaze. While some findings show autism might involve deficits in social brain functioning, other results suggest normal or differential functioning in some aspects of social information processing by people with autism.

Development of face processing in infant chimpanzees.

Masako Myowa-Yamakoshi¹, Masaki Tomonaga², Masayuki Tanaka² and Tetsuro Matsuzawa², ¹The University of Shiga Prefecture, ²Kyoto University.

We present three experiments on developmental changes in the ability to process faces in infant chimpanzees. Firstly, we investigated the facial imitation from just after birth. Results showed that chimpanzee neonates were able to imitate several human gestures such as tongue protrusion and mouth opening. Secondly, the ability of recognizing faces was investigated. We prepared photographs of the mother of each infant and an "average" chimpanzee face using computer-graphics technology. Before 4 weeks of age, the infants showed few of tracking responses and no preferences. Between 4 and 8 weeks of age, they showed strong preferences for mother's face. From 8 weeks, they again showed no preferences, but exhibited frequent tracking responses. Thirdly, we studied gaze perception. We found that the infants aged 10 weeks preferred looking at direct/open-gaze faces. However, in the context of scrambled faces, they did not show such differences. These findings suggest that gaze perception by chimpanzees may be influenced by the surrounding facial context. Our findings suggest that there may be similarities in the ability of facial information processing in humans and chimpanzees in their early stages of life. We discuss the relationship between gaze perception, face processing, and the adaptive significance of early social communication from an evolutionary perspective.

The evolution of "social eyes" as an exterior of the social brain.

Hiromi Kobayashi and Kazuhide Hashiya, Communications Research Laboratory, Kyushu University.

It should be important for an animal to detect quickly whether it being looked at by the other individual or not. The directed gaze to an individual has often been interpreted as a sign of hostility or anger and as releaser of the escape response for most of animals including humans (Tinbergen, 1958). However, at least in humans, the communicative function of the directed gaze is not limited to be like that; we usually interpret it as the signal for liking, trust, respect, and so on. Such multi-layered functions of the directed gaze might be found only in humans, though further comparative investigation is necessary especially in great apes.

Kobayashi and Kohshima (1997, 2001) have shown that the human eye has exceptional morphological feature in primates: it has the largest ratio of exposed sclera in the eye outline, and the extraordinarily elongated eye outline in horizontal direction. Furthermore, the exposed white sclera was observed only in humans. They explained such features of human eyes mainly as ecological adaptations, specifically, extending the visual field by eyeball movement, especially in the horizontal direction.

In this presentation, we report that the exceptional feature of human eyes should be explained not only by ecological factors but also by "social" factors. We found in primates high correlation between the eye morphology and the parameters reflecting social factors (relative neocortical volume and/or group size). The horizontally elongated eye outline might enable the animal to utilize the eyeball movement (independent of the head movement) to observe the other individual, possibly without being detected by the target. Such a morphological feature should benefit the animal in competitive situation. The evolution of neocortex as an inner device to deal with social problems (Humphrey, 1976) might need outer organs that adapt corresponding problems. In other words, the evolution of social brain might have changed not only the animal's behavioral pattern but also their morphology, as an outer communicative device.

The white sclera observed only in humans at least among primates might enhance the signal value of eye gaze. The lack of pigmentation in sclera should enable the gaze to serve as overt signal even from a distance (Hall, 1970), which should lead to multi-layered functions of the human gaze.

Saturday Early Afternoon Session (13:00-15:00)

Eye gaze processing and the Development of the “social brain”.

Teresa Farroni, Birkbeck College.

The perception of faces, and the understanding that faces can reflect internal states of social partners, are vital skills for the typical development of humans. Of particular importance is processing information about eyes, and eye gaze direction. In adults the perception of averted gaze elicits an automatic shift of attention in the same direction, allowing the establishment of joint attention. Mutual gaze provides the main mode of establishing a communicative context between face to face humans. The importance of eye-gaze perception has generated much controversy as to its developmental and neural basis. In fact, the major debate in social cognitive neuroscience concerns the origins of the "social brain" in humans, and theoretical arguments about the extent to which this is acquired through experience are raging. Here we will review evidence from recent neurophysiological and behavioural studies with both adult and infants on the processing of direct and averted gaze. Our results suggest that mechanisms underlying the use of averted gaze for shifting attention are present from early in life, but that those may differ between infants and adults. With regard to direct gaze, recent studies show that even newborns prefer to look at faces that engage their mutual gaze. Further, our electrophysiological evidence shows that at least from 4 months of age faces with direct gaze show enhanced processing as compared to those with averted gaze. We conclude by speculating on mechanisms that underlie those early abilities, and suggest they provide the foundation for later more complex social cognition.

Effect of eye aversion on the early stage of gaze processing in children.

Ikumi Kimura, Masaya Kubota and Yoichi Sakahihara, The University of Tokyo.

[Background] It is widely accepted that face and gaze perception is an essential element for non-verbal communications in human social life. Several studies have reported the effect of gaze direction on N170, the well-known face-sensitive component of event related potentials (ERP) at about 170ms post-stimulus, in human adults. However, little is known about the effect of eye direction on the gaze processing in children. [Subjects and Methods] We recorded visually evoked magnetic fields and event related potentials in response to the stimuli of a face in two gaze conditions ("Gaze" task) or two equiluminous mosaic images ("Mosaic" task), in healthy children aged 8-12 years and adults aged 26-34 years. [Results] In children, a clear occipito-temporal magnetic fields activity "P1m", corresponding to the P1 peak of ERP preceding the N170, was observed bilaterally. Only the right P1m was increased at viewing the averted gaze than at viewing the forward gaze in children, and this effect on the P1m was not observed in adults. The source for the right P1m in children at the Gaze task was mainly estimated to be located at the posterior part of the inferior temporal sulcus, around the putative human MT/V5 area, while in adults, the estimated source for the right P1m was mainly distributed around the posterior occipital cortex. For the "Mosaic" task, there was no significant difference between conditions. [Conclusion] It was suggested that the area around MT/V5 in children contributes to P1/P1m component and might be sensitive for biological salient motion such as gaze or changeable

aspects of face, like the more specified role of the superior temporal sulcus (STS) region in adults.

Eye contact detection in autism: neural and behavioral evidence.

Atsushi Senju, The University of Tokyo.

Eye contact conveys rich information and establishes effective communication in human social interaction. Atypical eye contact behavior is observed among people with autism, who suffer from severe difficulties in social interaction and communication. However, it is still controversial about the nature of cognitive and neural underpinnings which produce atypical eye contact behavior in individuals with autism.

We will present recent findings from our studies investigating how individuals with autism perceive and react to perceived eye contact through behavioral and neural measurements. Children with autism and typically developing children (age: 9-15 years) participated in these studies. Written informed consent was obtained from all the children and their parents, which had been approved by the ethical committee of the University of the Tokyo.

In the behavioral testing, children were required to detect faces with either direct eye gaze or averted eye gaze and press a corresponding key as soon as possible. Results revealed that children with autism were equally adept at detecting direct and averted eye gaze, which contrasted with the facilitative effect of direct eye gaze on the performance of typically developing children.

In the neural assessment, ERPs were recorded from children while they were looking and attending to either direct or averted eye gaze. Results revealed that eye gaze direction made no effect on the ERPs of the children with autism, while perceived direct gaze elicited larger negative ERP component in occipito-temporal area in typically developing children.

These behavioral and neural findings collectively suggest that children with autism lack the neural mechanism 'tuned' to the other's direct eye gaze, or perceived eye contact, which typically developing children are equipped with.

Saturday Late Afternoon Session (15:30-17:30)

Neurodevelopmental bases of communicative impairment in autism.

Ralph-Axel Müller, San Diego State University.

Although diagnostic criteria for autism have been tightened in the past years, the disorder is still defined by behavioral outcome. It is therefore unclear whether autistic phenotypes can be explained by a unique type of neurodevelopmental aberration. Nonetheless, socio-cognitive impairments are, by definition, a common core in autistic phenotypes. I will review some of the most promising recent findings on developmental neuroscience in autism (such as evidence for brain growth abnormalities) and will discuss how these may relate to disturbances of social cognition. Further, I will focus on evidence from functional neuroimaging suggesting that processing efficiency of autistic neocortex may be broadly diminished and that functions requiring polymodal integration tend to be impaired. These findings can in turn be regarded as a first step to a better understanding of why autistic patients are impaired in ingredient processes of language acquisition (such as imitation and joint attention).

Perception of phoneme sequence by Japanese adults and infants.

Sachiyo Kajikawa, Laurel Fais, Janet F. Werker and Shigeaki Amano, NTT Communication Science Laboratories.

The speech perception of humans is tuned to their native language. One of those language-specific perceptions is Japanese speakers' auditory illusion of an epenthetic vowel between the consonants in the C-C cluster in words of the form VCCV (Dupoux, Kakehi, Hirose, Pallier, & Mehler, 1999). On the other hand, C-C clusters are accepted in some contexts of fluent Japanese speech. For example, high vowels (/i/ and /u/) tend to be devoiced when they appear between or after voiceless consonants (e.g., k<i>sha). In these contexts, it can be hypothesized that Japanese speakers feel that voiced vowels are unnatural or disfluent. In that case, Japanese speakers may discriminate between contexts where vowel devoicing is likely to occur and those where vowels are likely to be voiced. On the other hand, Japanese speakers may neglect differences between words with voiced vowels and those with devoiced vowels, because of their perception of vowel epenthesis. This study sheds light on how Japanese speakers perceive phoneme sequences according to Japanese phonotactic features. First, we investigated Japanese adults' goodness ratings of nonsense words as exemplars of Japanese words. The adults were presented with two- or three-mora words with voiced vowels (CVCV, CVCVVCV) and the same consonant configuration without some of the vowels (CVC, CVCC). The adults rated the CVC forms where vowel devoicing occurs in natural speech better than CVC forms where devoicing is not allowed. However, they rated CVC and CVCC worse than CVCV and CVCVVCV. These results indicate that Japanese speakers are sensitive to the legitimacy of vowel devoicing. In addition, Japanese speakers tend to consider phoneme sequences that follow the fundamental Japanese phonotactic rules to be better than exceptional but possible sequences. We also tested infants' sensitivity to phoneme changes in words that included vowel-devoicing contexts. Six-, 12-, and 18-month-old infants were presented with CVC, CVCC, and CVCVVCV nonsense words. The infants of all age groups detected differences between CVCC and CVCVVCV. However, only the

infants at 18 months of age detected differences between CVC and CVCC. These results indicate that vowels that can be devoiced are detected by infants from 6 to 18 months of age. On the other hand, sensitivity to word-final consonant changes might develop between 12 and 18 months of age. Based on the results of these experiments, the development of perceiving native phonotactic features will be discussed.

Exploring audiovisual speech perception in infancy. -On the basis of laterality and the role of experience-

Ryoko Mugitani, The University of Tokyo.

Speech perception is a multimodal function of human perception. Which means not only auditory input through ears, but also visual input through eyes, namely the movement of lips and a tongue, can be important information to perceive target speech correctly. Speech perception is developed remarkably in the first year of life in order to acquire one's native language. Therefore, investigating infant's audiovisual speech perception is inevitable to understand the process of language acquisition. Several pieces of past research have indicated that infants perceive phonetic information from the lips and sounds cross-modally (Kuhl 1982, Patterson 1999).

The present study was aimed at verifying whether specific language environment and experiences affect infants' ability to match lip movement for articulations with respective vocal sound. Two-display preferential technique and one display visual fixation technique were both employed, and several experiments testing infants' audiovisual matching on vowels and consonants were conducted sequentially.

As results, the infants showed robust audiovisual matching ability on perceptually and productively well-experienced sounds, such as vowel /a/ and bilabial trill. On the other hand, no evidence of audiovisual matching was suggested with sounds without abundant experiences. Also, testing by Two-display visual preference procedure, the infants could match consonantal sound (bilabial trill) only when the sound matched face was presented on the right hand side of display. This right side bias for audiovisual matching was shown even when infant's right/left visual fields were strictly considered. This finding supports a speculation of left hemisphere advantage on audiovisual matching and consonants processing.

Poster Session (March 12th, 17:30-19:30)

P-01: Does the processing of negative words need attentional resources?

Ken Kihara¹, Yoshiaki Nakajima², & Naoyuki Osaka¹

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We investigated the attentional processing of negativity bias before detection. If processing requires attentional resources, another attentional processing would interfere with it. Using emotional words, we examined whether detection performance of the subsequent target (T2) interfered with that of the preceding target (T1), such a paradigm is known as attentional blink (AB) and is an index of the attentional processing of undetected stimuli. In Experiment 1, we investigated whether AB and negativity bias appeared in our paradigm using two-character Kanji words as RSPV stimuli. The results suggested that performance of negative T2 was higher than that of neutral T2, indicating that both AB and negativity bias occurred. Experiment 2 investigated that negative T1 should grab attentional resource, called automatic vigilance during AB in our paradigm. The results showed that the performance of neutral T2 decreased when T1 was negative, indicating an occurrence of automatic vigilance. Experiment 3 was designed to explore whether the negativity bias of undetected negative stimuli interfered with automatic vigilance during AB using negative T1 and negative T2. The results, however, showed that processing of negative T2 was facilitated at Lag 1 during automatic vigilance induced by negative T1, it did not clearly show whether the cause of that effect was negativity bias or affective priming. Experiment 4 was conducted to determine test whether or not affective priming occurred in our paradigm using positive T1 and positive T2. The results did not indicate the occurrence of affective priming when both T1 and T2 were positive. Consequently, the present results suggested that the processing of negative stimuli was facilitated without attentional resources before detection independently of their negative intensity. Based on the two-stage models of AB and the two-stage models of the negativity bias, we proposed a unified model that describes the attentional processing of undetected negative stimuli.

P-02: Infants' reaction to another infant.

Wakako Sanefuji

Graduate School of Human-Environment Studies, Kyushu University

In daily life, we can often observe that infants gaze at another infant, as adults do. Is it possible to explain that by preference for "baby schema" like the case of adults? According to Negayama(1997), the face just before one year old was chosen as the cutest one by adults. Alley(1983) suggested that the impression of attractiveness made from the whole body achieved a maximum in childhood between 2 and 11 years, rather than in infancy. However, it has not been investigated whether infants prefer special month-aged infant as adults do. As for another possibility, an infant might see other infants as he/she considers them as rivals for investments given as protection in the same community? Regression is one of the interesting cases. Not only comparing adults with infants but also comparing various aged infants would offer the key to an understanding of the cause. Comparing various aged infants would offer the key to an

understanding of the reason. For infants, one year is long enough to come to walk and talk. The present study examined whether infants discriminate another infants' age and how they react to infants who are same, older, and younger infants.

To research this, I prepared VTR stimuli without sound. For the stimuli, each four person in 5 different ages, which are 6-, 9-, 12-, 36-month and adult, was asked to play each 3 kind of objects. As stimuli, I used each 20-s scene from those. The participants were divided into two groups due to their month-age: 6-month olds and 9-month olds. Their looking time and physical reactions were measured.

P-03: The effect of positive emotion on infant's gaze shift.

Misa Kuroki

Graduate School of Human-Environment Studies, Kyushu University.

Joint attention is famous phenomenon that two men (in particular, infants and their caretakers) shared their attention toward same object. In recent studies, the relation between emotion and joint attention was focused. For instance, Folm(2000) suggested that affective expressions of adults contribute to visual joint attention of 7-month-olds. Thus the studies, which take up the relation between caretakers' (or adults') emotion and infants' response to joint attention, were in progress. But on the other hand, the relation between infants' emotion and joint attention was not clarified yet.

Adamson & Russell(1999) proposed that arousal of infants' positive emotion with objects would be opportunity to shift their gaze from objects to caretakers in early days of joint attention. This idea was very attractive to investigate the relation between infants' emotion and joint attention initiated by infants.

So in this study, we examined whether infants' gaze switching would be affected with their emotion in particular with their positive emotion, as a first step of investigating infants' emotion and joint attention.

Purpose & Hypotheses: The purpose of this study was to investigate the influence of positive emotions on infants' gaze shifting. It was predicted that when infants be aroused positive emotion by objects, they shift their gaze between objects and their caretaker.

Participants: 6- to 12- months old infants and their caretaker were recruited for this investigation.

Procedure: Infants were required to sit in baby chair with a attractive toy in front of them. Their caretakers sat beside them, and were instructed not to engage their infants. Infants were allowed to play with them freely for five minutes. In data analysis, infants' facial expressions and direction of their gaze were coded.

Result: Rates of infants' gaze switching were compared in neutral expression and positive expression. As a result, the hypothesis was supported.

P-04: The inhibitive effect of punishment on stereotype activation.

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This study examined the inhibitive effect of punishment on activation of female stereotypes. Fifty male students were randomly assigned to two conditions: punishment condition or control condition. The experiment was constructed of three phases. The first phase was to manipulate the punishment; participants

counted syllables of two words presented on CRT under the instruction that aversive sound was presented if they made mistakes. However, the aversive sound was presented regardless the participants' answers; in the punishment condition, aversive sound was inflicted as punishment when negative female stereotypical associations (e.g. Woman-Dependent) were presented, whereas in the control condition, the sound was given when unrelated words to female stereotypes were presented. In the second phase, the activation of female stereotypes was measured with a semantic priming paradigm (i.e. word recognition task). The targets were constructed of non-words and three kinds of female stereotypical words: negative stereotypical words (e.g. hysterical, nagging), positive stereotypical words (e.g. modest, lovely) and unrelated words to female stereotypes (e.g. vague, various). "Woman" and "People" were presented as prime words, and reaction time toward the target word under these two primes were compared. In the third phase, participants' explicit attitudes toward women were measured with a questionnaire. The results indicated that the negative female stereotypes were more activated in the control condition than in the punishment condition, and positive rather than negative female stereotypes were activated in the punishment condition. Moreover these effects of punishment were not modified by participants' explicit attitudes toward women. The mechanisms governing the inhibitive effect of punishment on stereotype activation and the role of valence of stereotypes in the activation were discussed.

P-05: How the brain expresses and understands intentions.

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It is a widespread assumption that an utterance expresses a certain intention of the speaker, and that to understand the full meaning of such an utterance, his intention needs to be rediscovered by the addressee. So far, however, neither a general way of computing the speaker's intention from its utterance, nor a way of generating utterances from intentions is reported in the literature. In this study we address this problem by building a computational model of language acquisition, in which each agent learns a forward model that predicts for every utterance its (context-dependent) effect. This forward model is learned by observing language use of other agents and is then used (i) to find the right utterance for an intended effect, and also (ii) to understand other agents by mapping speakers' utterances on their intentions.

To test whether the proposed mechanisms can accomplish these goals, we designed a simulated game environment, where agents need to "eat" certain types of "food", growing on "trees". The agents can either harvest a tree, ask another agent for a type of food, give a type of food to another agent, or do nothing. To train the agents in this game we use TD(0) reinforcement learning. An agent learns a value function that evaluates the states, and uses it along with a rule-based forward model to select actions.

On top of these capabilities, two agents with a rule-based forward model are used to train one language learner. Using supervised learning, the learner trains his forward model by observing the communication of the other agents. We were able to show, that the relation between intentions and utterances can be learned by such a model and that, in a simulated environment, it can be used to

communicate well with respect to a task.

P-06: Are facial expressions contagious among Japanese people?

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Previous studies have revealed that facial expressions of emotion are transmitted from one person to another automatically (Hess & Blairy, 2001; Lundqvist & Dimberg, 1995). In these studies, responses of *Levator labii superioris* for disgust face, *Zygomaticus major* and *Orbicularis oculi* for happy face, and *Corrugator superioris* for angry face were observed respectively. *Corrugator superioris* also responded for sad face. These responses have not been confirmed among Japanese people. The purpose of this research is to confirm that Japanese people also mimic other's facial expressions of emotion automatically. I used happy, sad, angry, and disgust face from Matsumoto and Ekman (1988) as stimuli in this experiment. Following the procedure of Hess and Blairy (2001), neutral face and emotional face were presented sequentially in this experiment. Contagions of facial expressions of emotion were measured by the differences between electromyography (EMG) for a neutral face and that for emotional face. Results show that *Corrugator superioris* responded for angry and sad face as predicted, while responses of *Levator labii superioris* for disgust face and *Zygomaticus major* and *Orbicularis oculi* for happy face were not identified. After controlling for the sex effect, I found that the responses of *Corrugator superioris* for angry and sad face were strong among males. These results contradict the findings in the previous studies (Hess & Blairy, 2001; Lundqvist & Dimberg, 1995). Potential problems of stimuli and the method that were used in this experiment are discussed.

P-07: The effects of congruent facial response on subject's facial expression.

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Tomkins (1962, 1963) argues that a facial expression engenders a corresponding expression in an observer. It is commonly known that congruent facial expression is evoked by pictures of faces expressing not only happiness but also anger and sadness. However, interactive effects of facial responses on subject's face and counterpart's face in continuous sequences have not been explored at all. In this study, we observed how a subject's facial expression of an emotion is affected by synchronized facial responses. Subjects were asked to display facial expression of happiness, anger or sadness and communicate with counterparts using only facial expressions. We utilized recently developed technologies that enable to synthesize counterpart's facial expressions corresponding to subject's expressions as facial images on a computer display. This facial image sequences are synthesized for responding to the subject's expressions using a real time facial expression recognition-synthesis system. Synthesized images are the same or opposite/different categories in congruent or incongruent conditions respectively. For example, while a subject is smiling, in congruent condition, counterpart shows a smiling

face with a corresponding intensity and in incongruent conditions faces of counterpart turn into anger or sadness. Subjects maintained their anger expressions in congruent conditions. For happiness expression, facial congruency didn't affect facial responses of subjects however. We also observed that the responses of counterparts of the different race helped the subject to enhance his/her sadness expression in congruent conditions.

P-08: Investigating environmental (or social) self: An ERP (P300) study of recognition of personal possessions.

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When considering what self is, there are two aspects; Conscious self and environmental (or social) self. Conscious self here means the cognitive functions based on recognizing one's own motor action with its feedback (e.g. Blakemore et al., 2000). On the other hand, environmental self refers to functions processing information related to self preferentially (self reference effect etc.). However, although the explanation in terms of "cognitive resource allocation" is widely known, what is actually going on in the brain? By date such a question was hard to handle with experimental psychophysiology, because it is difficult to introduce social situation in dark and isolated laboratory experiment. This research is aimed for investigating the basic neural mechanism of environmental self with newly-devised design, and thus trying to confirm the first step of investigating environmental self.

We employed two-stimulus oddball paradigm, which is known to elicit P300 (a kind of ERP regarded as reflecting the allocation of cognitive resources) for low-frequent stimuli. Before the experiment, we took pictures of subject's personal possessions and graphically cut them out from background and made them as visual stimuli of subject's possession (P). On the other hand, pictures of others' possession were similarly processed as others' possession (N). In the experiment, we controlled the display frequency of P and N such that high-frequent: low-frequent = 80:20. The combination of stimuli was NN (it means high-frequent = N, low-frequent=N), PP, and NP. Thus we recorded and measured P300s to see effects of possession on modification of P300.

The result showed that amplitude of P300s in low-frequent stimuli was NP > PP > NN. This result supported the conventional theory that we allocate more cognitive resource for self-related information. It may also suggest that investigating environmental self with a method of using personal possession was within the range of possibility.

P-09: Self-reference effect and meta-attitude as the self-knowledge.

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The meta-attitude is not the attitude itself but the meta-knowledge about the attitude. The purpose of this study is to examine the meta-attitude (i.e. subject's own knowledge of what kind of personality traits the subject likes) as the self-knowledge.

In experiment 1, subjects were asked to rate each trait words in one of five judgment conditions: meta-attitude (like-dislike), self-descriptiveness (real-self), desirability, semantic, and physical. Then they were given the surprised recall task. Meta-attitude and

self-descriptiveness tasks produced greater recall than semantic task. This is, the self-reference effect occurred. This results suggests that the meta-attitude is a rich knowledge structure as well as the real self.

In experiment 2, in order to estimate degree of overlap of processing between the self-descriptiveness judgments and the meta-attitude judgment, the task facilitation paradigm was used. When the initial task was self-descriptiveness judgments, time for the meta-attitude judgments in the target tasks were faster than when the initial task was the semantic judgment. That is, the process of meta-attitude judgments and self-descriptiveness judgments overlaps each other. This result suggests that the meta-attitude is one of the self-knowledge in the semantic memory system.

In experiment 3, in order to distinguish between self meta-attitude and other meta-attitude, a two-factor within subjects design was used. The first factor was the type of referent person: self and other. The second factor was the type of orienting task: descriptiveness and like-dislike. After an incidental learning, then they were given the surprised recall tasks. A two-way ANOVA on the recall score revealed the main effect for the the referent person. This result suggests that self meta-attitude is richer than other meta-attitude as the self knowledge.

These results suggest that the meta-attitude is one of the self-knowledge in the semantic memory system and has same property as other self-knowledge.

P-10: Exploration of the action monitoring system by using error-related negativity (ERN) as an index.

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The negative component of event-related potential (ERP), which is related to error commission or negative feedback against one's response, has been focused and called an error-related negativity (ERN/Ne). It is generated from the anterior cingulate cortex (ACC) and regarded as a signal which means that the consequences are worse than expected. ERN/Ne is taken as the key to understand the action monitoring system because it has been suggested that it correlates with behavioral indices of response control and uncertainty about the given response.

Frequency effect on ERN/Ne, Holroyd & Coles (2002) reported that the larger ERN/Ne was observed in high frequent response condition. However, it has not been clarified whether such sensitivity of ERN is due to the frequency of visual stimulus appearance or that of motor response. The purpose of this study was to examine which kind of the frequency dominantly influences ERN/Ne, stimulus-processing or response-processing.

In this study, participants performed the Eriksen flanker task (Eriksen & Eriksen, 1974). The frequency of stimulus appearance and motor response were independently manipulated in order to examine which situation evoked the larger ERN/Ne. As a result, our data suggested that the frequency effect on ERN/Ne which was previously reported by Holroyd & Coles (2002) should have been induced by the frequency of motor response rather than the stimulus appearance. The larger ERN/Ne was observed in high frequent response condition, and the smaller ERN/Ne was observed in the Low-frequency of response condition. There was no significant difference observed between response time and error rate by the stimulus frequency in the same high response condition.

Conclusively, our data supported the idea that ERN/Ne was influenced by the bottom-up control including the motor frequency.

P-11: Gender difference in the role of the cognition of social dangers in phobias.

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INTRODUCTION: Recent researches demonstrate the cognition is important factor for maintenance of the symptoms in phobias. The purpose of the present study is to see the role of the cognitions contributing to interference with one's life.

METHODS: Subjects were presented fearful situations in the form of writing and requested to imagine it as vividly as possible. While imagining each situation, Ss had to answer the following questionnaires.

a) Fearful Cognition Scale

This was designed to measure various cognitive factors when one feels fears. This constituted four subscales: cognition of physical response, coping, social danger, and primary danger. While all subscales except primary danger had the common items among all four situations, subscales of primary danger only were made up of different items depending to each situation. In each instance Ss had to rate how much they believed each statement to be true on 5-point Likert-type scale.

b) Fearful Emotion Scale

The Negative Affect Scale including 8 items which is a subscale of the General Affect Scale were adopted to measure the intense of the fearful emotion.

c) Fearful Behavior Scale

This was developed to measure the avoidance behavior tendency and the interference with daily life caused by the fears in each situation, each subscale including 4 items.

RESULTS & DISCUSSION: Multiple regression analyses predicting interference by all cognitions, emotion, and avoidance were conducted in both sexes in each situation. In male, cognition of social danger predicted interference significantly in all situations, while only in spider situation in female. The results may indicate in men cognition of social danger is more closely related to interference than in women. For men, cognition of social dangers, namely, taking attitudes for fearful objects in childish way and looking foolish may have more damage to social activity than subjective fearful feeling to the objects.

P-12: Do PDD children show the face-inversion effect?

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Pervasive Developmental Disorder (PDD) is one of the Disorders of Psychological Development, characterized by a chronic impairment in socialization, language, and imagination. The present study examined what makes the children with PDD worse to recognize facial expressions of emotion. PDD and non-PDD children were shown the virtual realistic average faces in the normal up-right orientation condition and the inverted one, and asked to judge the perceived emotions in either orientation. If PDD children could process the face as a whole when observed the up-right faces as well as non-PDD children and also we could do, the inversion effect should be expected to occur. In the experiment 25

PDD children (23 males and 2 females) and 23 non-PDD children (19 males and 4 females) participated. The mean age of PDD children were 7:4 (SD=1:4), and non-PDD children were 4:8 (SD=0:6). They were matched with the preoperational period in the stages of J.Piaget's developmental sequence. The following results were obtained: PDD children did not differ in their up-right or inverted orientation (A' : $t(24)=0.89$, n.s., FA%: $t(24)=-0.78$, n.s.), and, non-PDD children did (A' : $t(22)=3.27$, $p<.05$, FA%: $t(22)=-4.87$, $p<.05$). Thus, the result revealed that PDD children do not show the inversion effect, indicating that they process the partial information even when observing the up-right faces. According to Diamond & Cary (1986), in the case of the dog pictures presented inverted, the dog novices do not show the inversion effect also. One interpretation of this result is that PDD children do not get used to seeing facial expressions of emotion, in contrast to non-PDD children. This interpretation is in agreement with symptoms of PDD.

P-13: The effects of olfactory stimulus intensity and preceding cue on hemodynamics in orbitofrontal region: a near-infrared spectroscopy study.

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In this study, we investigated whether near-infrared spectroscopy (NIRS) can measure the hemodynamics in orbitofrontal region which reflects olfactory processing. Eight healthy subjects participated in this study. Olfactory processing is known to be effected not only by attributes of stimulus, but also subjects' internal expectations concerned with the stimulus. We manipulated the stimulus intensity (STRONG, WEAK and CONTROL condition) as the attributes of stimulus, and the availability of preceding cue (WITH CUE and WITHOUT CUE condition) for the onset of the stimuli as the modifier of expectations for stimulus (both were the within-subject independent variables).

In WITH CUE condition, activations in STRONG condition were not different from baseline (activation at rest). However, activations in WEAK and CONTROL (odorless) condition decreased from baseline. On the other hand, in WITHOUT CUE condition, activation in STRONG condition increased from baseline, and activation phase in WEAK condition declined from STRONG condition. Activations in CONTROL condition were not different from baseline.

NIRS measures hemodynamics in cortex at relatively shallow depth (almost 25 mm). The hemodynamics in this study indicates that activation in orbitofrontal cortex was linearly increased as a function of the stimulus intensity. However, when preceding cues were available, expectation was evoked by the cues and it activates the deep structures (i.e., cingulate gyrus and amygdale, which are involved in expectations and NIRS can't measure the hemodynamics which occur in such a deep place), thus it is considered that the blood deceleration from orbitofrontal region was occurred in the consequence of the blood concentration to the deep structures. This confirmed that the availability of NIRS in measuring the hemodynamics in orbitofrontal region which evoked by olfactory stimulus.

P-14: The motivation of self-presentation on social anxiety.

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The anxiety in front of others is called as “social anxiety”, and this phenomenon has been often explained by self presentation model (Schlenker and Leary, 1982). This model has two components: the motivation of trying to present their own good self image, and the efficacy to do such action. This model is also usable to merge the previous psychogenetic of social anxiety. Leary (1983) emphasized not only the motivation of presenting positive self-image but also the motivation of avoiding negative self-image. This aim of present study is to confirm the correlation among social anxiety, motivation for acquiring praise or avoiding rejection, and consider which motivation has more important influence on social anxiety. In correlation analysis, while the correlation between social anxiety and motivation for avoiding rejection was positive, the correlation with motivation for acquiring praise was negative. This result suggested that social anxiety is fundamentally the anxiety for negative evaluation from others, and that the purpose of self-presentation had very important influence on social anxiety. Two-way analysis of variance (ANOVA) showed that both main effects and interaction were significant, and that degree of motivation for acquiring praise had influence on social anxiety when the degree of motivation for avoiding rejection was high, while the degree of motivation for acquiring praise has no influence when that was low. This suggests that motivation for acquiring inhibits motivation for avoiding rejection. It is considered as the element of new treatment technique.

Keyword: social anxiety, self-presentation, motivation for acquiring praise, motivation for avoiding rejection.

P-15: Theory of mind in a communicative context.

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It is commonly considered that theory of mind fully develop by the age of 5 or 6. However, Keysar, Lin, and Barr's (2003) recent study shows that even normal adults sometimes fail to use theory of mind in a communicative context. This study attempts to conceptually replicate Keysar et al.'s results and extend the study. Participants in this study engaged in a communication game with a confederate. In the communication game, one person played a role of message sender and the other played a role of receiver. Participants were assigned either role. The sender requested the receiver to pass a certain snack to the experimenter. The receiver followed the request. Before the game, the experimenter asked the confederate to wait room for a while outside the room. In the absence of the confederate, the experimenter took out two snacks from their boxes and put them into different boxes (i.e., snack A was placed in the snack B's box and vice versa). When the participants are in the sender role, given that the confederate does not know that some boxes contain deceptive contents, participants should ask to pass snack B to the experimenter so that the experimenter will receive snack A. On the other hand, when the participants are in the receiver role, when asked to pass the box of snack A, they should pass the box of snack B so that the experimenter will receive snack A. Obviously, theory of mind is required to be successful in both sender and receiver roles. Theory

of mind ability was also assessed with some games that require strategic reasoning and theory of mind. Interestingly, success in a game was correlated with success as a receiver ($r=.55$, $p<.01$, $n=27$), but not with success as a sender ($r = -.05$, ns , $n=21$).

P-16: 'Present self' for 3-year-old children.

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Povinelli et al. (1996) gave rise to an important question on a temporal aspect of self-recognition. Using videotaped image, they revealed that even 3-year-olds couldn't utilize 3-min delayed self-image on an analog of the mark test. They interpreted this children's failure was due to their underdeveloped episodic memory. However, we rather interpret this failure was due to difficulty of detecting the contingent relation between children's action (proprioceptive information) and their delayed visual feedback. If the children could detect such temporal imperfect contingency on delayed feedback, they would find the temporal causal connection between delayed image and their current states. In this study, to be easy to detect visual-proprioceptive contingency relation, we extended the Povinelli's experiments by introducing much shorter temporal delay and some prior experience of delayed contingency.

In Experiment 1, we investigated the effect of 1- or 2-sec delayed feedback on an analog of the mark test and got follow findings. First, although 88% and 71% of the 3-year-olds in the live and 1-sec delayed group could pass the mark test, only 38% did so in the 2-sec delayed group ($p < .01$). Second, 83% in 1-sec delayed group were judged as showing spontaneous explorative behaviors (hands shaking, tongue protrusion etc.) for detecting contingent relation before searching for the sticker, whereas 44% and 38% in the live and the 2-sec delayed group, respectively ($p < .05$).

In Experiment 2, we examined whether some prior experience of delayed contingency improves children's detection of visual-proprioceptive contingency. The children were presented their 2-sec delayed feedback and also required mimicking experimenter's action for about 60-sec before the mark test. Ninety-four percent of 3-year-olds passed the mark test ($p < .001$). Interestingly, in the delayed contingency experience phase, 71% showed spontaneous explorative behaviors.

These results suggested that children's self-recognition on delayed feedback is supported by detecting visual-proprioceptive contingency.

P-17: The effect of dynamic property of a face on the recognition of emotional facial expressions. -Analysis by fixation-points-

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We focused on the effect of the dynamic property of moving faces on face processing, particularly on eye movements as the cognitive strategy of an observer. We investigated what cue observers use to judge moving emotional facial expressions when presented band-pass-filtered faces.

METHOD: A 2AFC task was employed. We used a 2 x 2 x 3 factorial design with presentation formats (dynamic and static), emotional facial expressions (happy and sad), and spatial frequencies (low-pass filtered, high-pass filtered, and original). We also recorded eye movements to monitor saccades made by the

observer, and analyzed the data by the VVF (Variance Value of Fixation-points) equation.

RESULT: [Original faces] The VVF decreased on moving faces in comparison with that obtained on static faces. The VVF on happy faces was smaller than that on sad faces. [High-pass filtered faces] The VVF increased for moving faces in comparison with that obtained for static faces. The VVF on happy faces were larger than that on sad faces. In addition, the VVF on happy faces did not increase with morphing rate, although the VVF on sad faces increased.

DISCUSSION: The results suggest that humans may utilize different cues to recognize moving and static faces. This implies that the effect of the dynamic property of a face changes with the spatial frequency of emotional facial expressions. In particular, in the case of a high-pass filtered happy face, the dynamic property may facilitate the integration of local components of the face, and make the configural information of the face.

P-18: Predictors of unexpected approaches by strangers; with impression ratings of a natural gait.

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We examined predictors of unexpected approaches by strangers, with the perspective of the estimation of a target person's social attitude through expressive behavior in a natural gait. Three conditions were considered; sexual approaches from a man to a woman [1) to pick up, 2) to grope without permission], and 3) nonsexual approaches. Female walkers ($n = 23$) reported the frequencies of encountering those approaches and their personality traits (self-monitoring and Big Five). Male raters ($n = 53$) viewed video segments (mean length: 15.7s) of the women walking in vicinity of Shibuya station, and rated their appropriateness as targets for those approaches and impressions of their physical traits.

Men's ratings of a woman's appropriateness depended on her grooming and physical attractiveness, but corresponded with the reported frequency of actual experiences only partially. Analysis revealed that the best predictor of the frequency of being a target for picking up was a woman's self rated self-monitoring trait (controlling strongly emotion expression), instead of her grooming or attractiveness. In regard to "groping", female grooming and awkwardness of movement were the best predictors. In regard to nonsexual approaches, self-rated extraversion of NEO-FFI inventory was the best predictor. Analysis also revealed the common predicting factor of the frequency of being a target for two kinds sexual approaches (picking up, groping) as awkwardness of movement. This factor related with the slowness of walking speed, but not with self-monitoring trait, bottom-wear nor with footwear.

P-19: Slightly different mechanisms of imitation between children with and without autism.

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We investigated whether the mirror image- or anatomical imitations and the positional relationship affect the performance of imitation in children with and without autism. Fourteen children with autism (mean age 11.9) and 18 typically developing children

(mean age 11.8) participated in two kinds of imitation tasks: imitating the model's simple hand action such as moving one hand to the ear (Hand and Ear Test; Head, 1920) or holding both hands out in front with the palms presenting backward or forward (Palm Test; referring to Ohta (1987)). There were two within-subject factors: positional relationship between the model and the child (face to face or side by side) and task instructions (for mirror-image or anatomical imitation). As a result of Hand and Ear Test, when sitting face to face, both children with and without autism made more mistakes in anatomical (i.e. crossed) than mirror-image imitation. But when sitting side by side, only typically developing children made more mistakes in mirror-image (i.e. axisymmetrical) than anatomical imitation, while there was no such tendency in children with autism. As for Palm Test, children with autism made 180° rotation mistakes (i.e. confusing the palms' direction of backward or forward) more frequently than typically developing children in both face to face and side by side position, which might suggest that children with autism made such rotation mistakes not because they were face to face with the model. These results indicated that children with autism may use somewhat different mechanisms in imitation from those of typically developing children.

P-20: Word meanings acquisition model via context information separation.

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The stance that "meaning is relationship" is the standard one in natural language processing, artificial intelligence and cognitive science studies. A word meaning acquisition model needs to be able to extract this "relationships". Meanwhile, a word has various meaning, often multiple. So, a system that extracts and learns relationship between the word and various sensory information needs to have an ability of detecting a polysemic word, separating the meanings and learning them independently. And the fact that human can identify the polysemic word without explicit labeling implies that a computer can identify and learn the polysemy with an algorithm without explicit labeling, too. But now, there isn't such a word meanings acquisition model focusing on this point. So, in this study, we regard a simple computer game as a model of real world and propose the word meaning acquisition model that learns relationships between the environmental information and a speech in the game, in other words, meanings of the speech using the structural learning with forgetting. And for the polysemic words, we take the environmental data as a mixture of gaussian distribution. The distribution approximates the separate meanings by the separate gaussian distributions of the environmental sensory data. We regard each of the distribution as the independent meanings. In the experiment on the game scene speech, the model could acquire the meanings of the polysemic word corresponding to intentions of the game player.

P-21: The comparison of the mechanism of embarrassment.

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There are three different theories of embarrassment of mechanism. First, the self-esteem theory insists that a loss of self-esteem

produces embarrassment. Second, the interaction theory explains that embarrassment is caused by a person's perception that he or she cannot perform coherently in a social situation. Third, the expectation theory proposes that embarrassment is fear when people will disappoint others' expectation. It has been not clear which theories is the most valid. The aim of present study is to investigate which three theories is the most valid empirically. 131 undergraduates were asked how embarrassed they feel in several situations.

In Study1, based on Parrot et al (1988), in order to test which self-esteem theory and interaction theory is valid, three actions to each situation predicted different result in two theory were presented. Parrot(1988) revealed that the interaction theory is valid, but in this study, the self-esteem theory was supported. We think that this conflict result can be explained by complexity of eliciting situation of embarrassment. According to Higuchi & Fukuda (2001), there are complex situational categories of embarrassment. And for the self-esteem theory, 'Private embarrassment' is important and this experiment included many situations of 'Private embarrassment'. So the self-esteem theory may be supported.

In Study 2, in order to test which interaction theory and expectation theory is valid, four actions to each situation predicted different result in two theory were presented. This study mainly supported the interaction theory, but in some participants, the interaction theory was more applied to the expectation theory than the interaction theory.

Based on these results, it was suggested that the selection of eliciting situation is important in order to investigate which theories is most valid, because a definition of embarrassment is obscure.

P-22: The placements of facial expressions of emotion in the two-dimensional space of affective meanings using the Affect Grid technique.

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Our previous study showed that two kinds of facial structural variables, so named as "slantedness" and "curvedness/openness," accounted for our judgments of emotion from facial expressions (Yamada, 1993). Another study revealed that these structural variables correlated with the dimensions of semantic meanings: the former correlated with "pleasantness," and the latter with "activity" (Yamada & Shibui, 1998). This study investigated the placements of facial expressions in the two-dimensional space of affective meanings, and the relationship between the visual information ("slantedness" and "curvedness/openness") and the affective meanings ("pleasantness" and "activity") involved in the recognition of facial expressions of emotion. Using four schematic faces representing happiness, surprise, sadness and anger obtained in Yamada (1993), six series of 21 schematic faces morphed from one expression to another were produced. In order to obtain the affective scores of each schematic face, the Affect Grid technique (Russell, Weiss, & Mendelsohn, 1989) was applied. A hundred and seven participants were divided into the two groups. In the first group (54 participants), three series of schematic faces ("anger-sadness," "happiness-anger," and "surprise-sadness") were

presented in random order, while in the second (53 participants), the rest series ("happiness-surprise," "happiness-sadness," and "surprise-anger") were presented in the same way. Participants were asked to rate the faces in terms of the Affect Grid technique. Affective scores obtained in this experiment were averaged out per face and plotted in the two-dimensional space of affective meanings. The placements of faces in the affective space were very similar to the ones in the visual information space. To examine the relationship between the visual information and the affective meanings, canonical correlation analysis was conducted. Two high significant correlations between the two variables were obtained. The result indicates that "slantedness" correlates with "pleasantness," and "curvedness/openness" with "activity," as shown in Yamada & Shibui (1998).

P-23: The role of a distraction goal in the relation between distraction and negative mood.

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Distraction is a useful coping strategy in overcoming depression. However, one of the features of distraction is avoidance coping, and so distraction is also considered to have negative effects. The present study focused on how one handles and moderates negative mood. Although distraction is avoidance as behavior, it is not always avoidance as intention. People can use distraction when they are trying to deal with a problem. Distraction may be used with a highly positive goal. In previous studies, there has been the confusion between coping use and coping goal. The purpose of the present study was to investigate the effect of a distraction goal on the relation between distraction and negative mood, so that distraction could be used more effectively. A questionnaire measuring approach goal, distraction, negative mood, and so on in the depressed event was completed by Japanese college students. On the basis of the students' scores, three groups (low distraction, high distraction and high approach goal, and high distraction and low approach goal) were identified. The results were as follows: In the negative mood scores, the score of the group with a high approach goal and high distraction was the same as the score of the group with low distraction. However, the score of the group with high distraction and a low approach goal was significantly higher compared to the score of the group with low distraction. It was therefore concluded that high distraction does not always lead to negative mood, and that using distraction with a high approach goal was an important way of moderating negative mood. The results also showed the importance of separating coping use and coping goal to investigate the effect of coping on negative mood.

P-24: Visual recognition of biological motion in children with and without autism: An ERP study.

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Autism is a severe developmental disorder suffering from difficulties in social interaction and communication associated with restricted, stereotypical behavior and interest. Recent advances in cognitive neuroscience have revealed that individuals with autism process social stimuli such as face, facial emotion or other's

mental states in atypical neural substrates. Current study recorded event-related potentials (ERPs) to explore whether biological motion (BM), another kind of social stimuli, is also processed atypically in children with autism. If children with autism have general deficit in processing social stimuli, it was predicted that they show atypical ERPs associated with BM perception. ERPs were recorded from 14 children with autism (age: 9:5 – 14:11, average age: 12:0) and 17 typically developing children (age: 9:5 – 14:8, average age: 11:10) while they were viewing animation of human walk depicted by 10 point-lights (BM) or those of randomly moving point-lights (scrambled motion, SM). Perception of BM and SM elicited negative components around 420 msec after stimulus onset at bilateral occipital-temporal scalp regions (T5 and T6). This component was thought to be analogous to the adult ERP component related to BM perception (N240; Hirai et al., 2003). Contrary to our prediction, children with autism, as well as typically developing children, elicited larger amplitudes of this negative component for BM than for SM ($F(1, 29)=6.1, p < .01$). Results suggest that children with autism, at least around the age range of current participants, have intact BM processing.

P-25: Probabilistic judgment of delusional ideation.

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Objective: Non-psychotic person sometimes has beliefs like delusions. These beliefs are named delusional ideations, and have many aspects similar to delusion. The purpose of the present study is to investigate whether "Jumping-to-conclusions" (JTC) reasoning tendency, which is one of main characters of delusions, would be found in non-psychotic undergraduates.

Method: Thirty-one undergraduates participated in the present study. Participants rated Peters et al. Delusions Inventory (PDI) and probabilistic judgment tasks (Colbert and Peters, 2002). PDI measures not only the amount of delusional ideations but also its distress, conviction, and frequency of those delusional ideations multidimensional. Probabilistic judgment tasks are used to investigate data gathering bias and conviction height of subjective judgment of certainly in studies about delusions.

Result: In the probability judgment tasks, the students with high score on PDI showed higher conviction about their judgment than students with low score on PDI. But it seemed that the amount of information had no relationship between students with high score on PDI and students with low score on PDI.

Discussion: JTC reasoning tendency would affect the development of delusional ideation. Since JTC reasoning tendency was seen in non-psychotic students, this findings supported the spectrum hypothesis that delusion is not discrete belief but continuous thought to non-deluded people.

P-26: The relationship between temperament, psychosocial stressor and delusional ideations in college students.

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Objective: Delusional ideation in the general population has been investigated recently (Johns and van Os, 2001). However, there were a few studies about the relationship between delusional ideation, personality and psychosocial stressor in normal samples. Cloninger et al. (1994) developed Temperament and Character Inventory (TCI). TCI was developed based on the

psychobiological model of personality. In the model of Cloninger, four temperament dimensions, novelty seeking (NS), harm avoidance (HA), reward dependence (RD) and Persistence (P) are dependent on central monoaminergic systems, respectively dopaminergic (NS), serotonergic (HA), and noradrenergic (RD and P). And the genesis of delusional ideation also has been related to psychosocial stressor (Garety et al. 2001). We examined the relationship between delusional ideation, psychosocial stress and temperament.

Method: Three hundred and eight college students (207 men and 101 women with mean age \pm SD of 18.75 \pm 1.67) participated in this study. The PDI, four temperament scales of TCI and Scale of Life Events in Interpersonal and Achievement Domains for Undergraduate Students (Takahira 1999) were administered.

Results: Regression analysis with PDI as dependent variable and TCI subscales and negative life events (stressors) as independent variable was conducted to examine the relationship between PDI, TCI and negative life events. There were significant β coefficients of three temperament scales (NS: $\beta=0.16$, RD: $\beta=-0.16$, P: $\beta=0.14$). There were also significant β coefficients of two kinds of stressors (achievement: $\beta=0.13$, interpersonal: $\beta=0.30$).

Conclusions: Regression analysis revealed that delusional ideation has relation to novelty seeking. This result supported dopamine hypothesis of delusional ideation. However, regression analysis also revealed that delusional ideation has more relation to interpersonal stressor than to temperament and the other stressor. The results of the present study suggested that delusional ideation in the normal population had relation to psychosocial factor rather than biological factor.

P-27: The relations of Eysenck's, Gray's and Cloninger's personality dimensions in a Japanese sample.

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Gray has defined the existence of two conceptual nervous systems: one of them called Behavioral Inhibition System(BIS), linked to anxiety; and another called Behavioral Activation System(BAS), related to impulsivity. Both systems arise from neurobiological and behavioral research with animals, and are supported by an important amount of experimental evidence. Initially, Gray's personality theory stems from a modification of Eysenck's personality model. Gray proposed a 45-degree rotation of Eysenck's Extraversion and Neuroticism dimensions(Gray, 1981). Later on, Gray suggested that the 45-degree rotation was purely schematic to explain his model, whereas a 30-degree rotation would be more exact(Pickering et al., 1999). In this study, we examined the accuracy of this assumption by the aspects of Eysenck's and Cloninger's, to be more precise, investigated following hypotheses; (1)the BIS and BAS scales must show orthogonality, not correlating with each other; (2)the BIS scale should correlate negatively with Extraversion(E), Novelty Seeking(NS) and positively with Neuroticism(N), Harm Avoidance(HA); and (3)the BAS scale should correlate positively with both E, NS and N, HA. From the analyses performed with 192 Japanese university students, the aforementioned hypotheses (1) and (2) were supported, but (3) was unsupported; BIS showed no correlation with BAS($r=-.13$), a negative correlation with E($r=-.36$), NS($r=-.22$), and positive with N($r=.85$), HA($r=.71$). BAS

correlated positively with E($r=.35$), NS($r=.47$), negatively with HA($r=-.30$), and had no correlation with N($r=.05$). The measurement of BIS and BAS dimensions is one of the main problems that Gray's model has no standard way to assess the personality dimensions that arise from the theory. In this sense, the future task is to investigate the interrelationships across many different scales commonly used in anxiety(BIS) and impulsivity(BAS) assessment, to provide some empirical clues that could help in the decision on which scale to use for the assessment of individual differences based on Gray's theory(in particular, BAS).

P-28: The effects of self-disclosure on self-disclosure recipients -Examination by depressiveness of the recipients-

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Purpose: It is said that rates of depression are increasing. It is also said that prevention of or recovery from depression in daily life is very important. Moriwaki et al. (2002) then examined the effects of self-disclosure and self-preoccupation on depression using path analysis. Path analysis (Structural Equation Model, SEM) indicated that inadequate self-disclosure of self-disclosers increase negative responses of recipients, and that these negative responses of recipients increase depression of self-disclosers. Self-preoccupation increased both inadequate self-disclosure and depression.

In this study, we experimentally examined effects of self-disclosure and levels of depression of the recipients on responses of disclosure-recipients.

Method: One hundred and twelve university students (67 males and 45 females) participated. The mean age was 20.56 (SD=3.73). First, participants rated their positive and negative feelings (Time 1). The participants were randomly divided into a depressive self-disclosure group and a non-depressive self-disclosure group, and were asked to read depressive or non-depressive disclosure script (Gurtman, 1987) correspondingly. Following this, they rated positive and negative feelings again (Time2) and also rated how they would react to the self-disclosure.

Result: The results showed an interactive effect of self-disclosure (depressive/non-depressive) and depressiveness (high/low) of the recipients on negative feelings of the disclosure recipients ($F(1,111)=9.56$, $p<.01$). Negative feelings of the high-depression group were higher when they were assigned to non-depressive self-disclosure than when were assigned to depressive self-disclosure, while negative feelings of the low-depression group were higher when they were assigned to depressive self-disclosure than when were assigned to non-depressive self-disclosure.

Conclusion: These results indicate that it is important to consider traits of the recipients when we think of the effects of self-disclosure on negative feelings of disclosure-recipients. Future studies should be conducted to examine the mechanism of this interaction in more detail.

P-29: The pattern of eye gaze in telling a lie.

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Eye gaze plays an important role in our communication. The present study focused on how human adults used eye gaze in actual social interaction. Especially, we tried to examine systematically

the pattern of eye gaze associated with lying and the relationship between eye gaze and utterance. Naive undergraduates participated in about 20-min. conversation with a conspirator who asked participant 2 questions. Participants were instructed to be evasive for one question and weren't given any instruction for the other question. Their face and voice were captured from hidden video camera and analyzed frame by frame. As a result, gaze pattern was significantly different between lying and not-lying condition. This difference was observed at the point when participants just started answering the question. These results seem to suggest that temporal structure of gazing behavior related with utterance could be important in ongoing social communication. How these gaze pattern can be perceived by another observer will also be discussed.

P-30: Development in memory of word's sound pattern in Japanese children.

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The purposes of this study are to examine the two problems. (1)Is there a difference between memory of sound pattern with word and sound pattern only?, (2)How developmental change are there in memory of word's sound pattern

In Exp. 1a 4-, 5-, 7-, 9-years old children and Adult asked for to recall of 8 sound patterns with clapping immediately. The results showed that children of all age level and adult showed higher recall in sound pattern with word condition than in sound pattern condition. Exp. 1b showed that adult showed same recall in sound pattern with non-word condition and sound pattern condition. Exp. 1 indicated that (1)memory performance of sound pattern with word is higher than memory of sound pattern without word, (2)this word effect was found in even 4 years old children.

In Exp. 2, 5- and 6-years old children were asked to recall of sound pattern with clapping in syllable sound pattern or mora sound pattern. The result showed that children show high recall in syllable sound pattern condition, but high language ability children show higher recall than low ability children in mora pattern. In Exp. 3, 5- and 6-years old children were asked to produce sound pattern of known words and unknown words. The result showed that children produce mora sound pattern with clapping both known word and unknown words condition.

These results indicated that (1)children acquire sound pattern of words as same as meanings and readings of words, (2)children will be able to use from syllable sound pattern to mora sound pattern developmentally.

P-31: TV-game play with "models of other" in three- to six-year-old children.

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In this study we attempt to confirm that three- to six-year-old children utilize "model of self", "model of environment" and "model of other" to interact with the external world.

We prepared two kinds of TV-game tasks to confirm utilization of "model of self" and "model of environment". The character in the game was operated with a joystick, and the goal was to have the character find a desired treasure from four treasure boxes shown previously to the children in a map. In the game, the character

suddenly moves toward the opposite direction for a few seconds. We compared the children's joystick performance between opposite and regular movement to investigate utilizing the "model of self". In another experimental condition, we changed the location of the treasures among the four treasure boxes to test having the "model of environment". Three- to six-year-old children changed their operational pattern to the joystick according to the experimental condition, which suggests that the children utilize "model of self" and "model of environment".

In the next experiment, we prepared a tag-like game. A participant operates a character (self-agent) and chases another agent (other-agent) when she is the tagger. If she is not the tagger, she has to run away. In the task, the children have to change their operation of the joystick according to their role. If the children have and utilize several "models of other", they do not have any problems playing. There are two playing conditions to control game difficulty. In the "cue" condition, a "star" circles around the agent to indicate which one is the "tagger". In the "no-cue (without "star")" condition, the participants have to estimate their own or other's role from their own or the other-agent's movement. Although this experiment is still in progress, we present some preliminary data.

P-32: An fMRI study of gaze perception in people with and without Autism.

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Autism is a psychiatric condition emerging in childhood characterised by severe social deficits. Among the most striking social characteristics of autism is abnormal gaze behaviour, although the neural mechanisms underlying these abnormalities are currently unknown. There has been a recent surge of interest in understanding the neural mechanisms for gaze discrimination in the normal population. The resulting research has produced neuroimaging findings allowing for hypothesis driven investigations about how gaze processing may be different in people with autism.

The aim of the present study was to use functional MRI to investigate neural differences between people with and without high functioning autism (HFA) or Asperger (AS) Syndrome during a gaze discrimination task. The study involved pictures of faces with eyes looking in various directions. Subjects made a choice about which direction the eyes in the pictures were looking towards.

When gaze was directed towards the participants, the normal control group showed significant activations in posterior social perception areas, and in the medial prefrontal consistently activated in Theory of Mind tasks. The group with HFA/AS showed more widespread activations in the posterior visuo-spatial processing areas of the brain, but no activations in the prefrontal ToM area. The results provide in vivo evidence for neural differences in gaze perception in autism.

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Certain brain areas appear to be particularly important for processing social information, and together these areas have been termed the social brain. It has been suggested that abnormal functioning of the social brain may be implicated in autism, a psychiatric condition characterised by severe social deficits.

We investigated neural activity of the social brain in people with and without high functioning autism (HFA) or Asperger (AS) Syndrome using fMRI. Our scanning paradigm involved showing pictures of faces with fearful expressions, and scrambled versions of these faces. Subjects pressed a button every time they saw a picture presented on the screen.

The normal control group (N = 13) showed significantly greater activation in areas of the social brain including the amygdala and orbital prefrontal cortex, compared to the group with autism. The group with HFA/AS (N = 13) activated these areas to a significantly less degree, and instead showed significantly greater activation of the superior temporal and anterior cingulate cortices. The results provide in vivo evidence for differential activation of the social brain in autism, and may reflect different processing strategies during social perception in autism. This work was funded by a program grant from the MRC (UK) to SBC and ETB.

P-33: Differential activation of the social brain in people with and without autism: An fMRI study.