two normal volunteers also participated as controls. The exclusion criteria were a psychiatric history and a neurological history. All participants had normal or corrected-to-normal vision. Demographic information, including the neuroleptic dosage and psychiatric status as indicated by the Positive and Negative Syndrome Scale score (PANSS; Kay et al., 1987), appear in Table 1. The two groups were matched for age, but patients had significantly fewer years of education.

This study was approved by the ethical committee at our institutions, and all subjects gave their informed consent prior to participation.

2.1.2. Stimuli

The experiment was controlled by Superlab software, and the stimuli were presented on a 14-inch computer monitor. There were three blocks to the experiment, each with a different stimulus for the cue. The cues were black line drawings representing rectangular eyes for the first block, arrows for the second, and elliptical eyes for the third block, as illustrated in Fig. 1.

In the first, Rectangle block, a fixation display was composed of one central circle subtending 0.4°, and two rectangles, each 1.8° wide and 0.9° high, the center of which was 1.0° above, and 1.4° to the left and right of the circle. The central circle was used as the fixation point, and was displayed for 675 ms, followed by the cue display. In the cue display, a black square subtending 0.9° appeared within each rectangle, positioned either centrally (straight 'gaze'), or 11% off the rectangle center to the right or left (right/left 'gaze'). The cue was presented for 100, 300 or 700 ms randomly (stimulus onset asynchrony; SOA), after which a target, X, subtending 0.6°, appeared either to the right or left of the cue, 7.1° from the central circle.

In the second, Arrow block, a cross subtending 3.9° horizontally and 1.9° vertically appeared in the center, of which the intersection served as the fixation point. For the cue, arrowheads or vertical bars appeared at each horizontal end of the cross. Arrowheads (1.3° × 0.6°) at both ends pointed in the same direction, cueing either to the right or left. The vertical bars (1.3°) served as the neutral cue, similar to straight gaze in other blocks. All other specifications were identical to the first block.

The third, Ellipse block was identical to the first block, except ellipses and circles were now used in place of rectangles and squares.

2.1.3. Design

There were three cue types (Rectangles, Arrows, Ellipses), each in three separate blocks. The order of the blocks remained fixed among subjects. Within each block, cue-target SOA (100, 300, 700 ms), cue-target relation (congruent, incongruent, neutral), cue direction (right, left, straight) and target location (right, left) were randomly selected with equal probability to make up a non-predictive, spatially cued, target detection test. Ten catch trials in which no target followed the cue were randomly dispersed within each block.

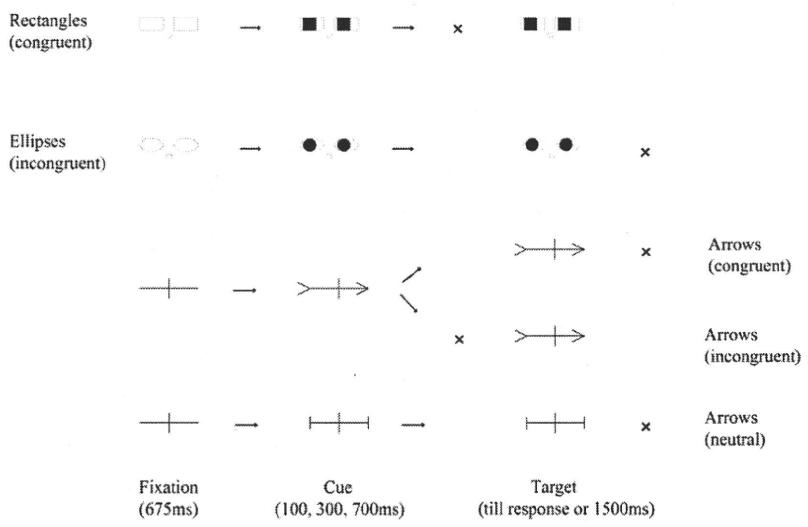

Fig. 1. Illustration of the trial sequence in the experiment. A fixation display was presented for 675 ms, followed by a cue display, which was either gaze or arrow direction. The cue was displayed for 100, 300, or 700 ms; then a target was presented, either to the right or left of the cue, and irrespective of cue direction.

Table 2
Results of the experiment

Cue type	Schizophrenia			Normal controls		
	RT	S.D.	%*E*	RT	S.D.	%*E*
Arrows	462	124	2.3	372	82	0.7
Rectangles	450	125	1.6	359	74	0.5
Ellipses	446	127	1.4	358	72	0.5
Overall	453	125	1.7	363	76	0.6

RT; reaction time (in ms), S.D.; standard deviation, %*E*; error rate.

2.1.4. Procedure

Participants sat 45 cm from the monitor. Subjects were instructed to maintain fixation throughout each trial, and upon target detection, to press the spacebar on the keyboard with their dominant index finger. The nature of the cue stimuli (e.g., their resemblance to eyes or arrows) was never mentioned, nor was the probability in relation to cue-target congruency. Fifteen practice trials were given before each block. The reaction time (RT) from the onset of the target to the pressing of the key was recorded. Time out was set at 1500 ms, with an inter-stimulus interval of 3000 ms. A total of 190 trials constituted one block, which took approximately 15 min to complete. Subjects were given a minimum of 10 min between blocks to rest. The patients were monitored for any change in their psychiatric state throughout this period, but all patients remained stable. There was no change in medication for any of the patients during this period. Eye movements were not monitored for the control subjects, for it has been confirmed in a number of studies that normal subjects reliably do not move their eyes in similar experiments (Posner, 1980; Friesen and Kingstone, 2003; Friesen et al., 2004). Patients with schizophrenia were monitored for eye movements by direct viewing of the experimenter. One patient had difficulty maintaining fixation and was therefore removed from the patient group. All 22 patients who were included in this study were able to maintain fixation almost all of the time.

3. Results for Experiment 1

Errors, defined as anticipations (RTs < 100 ms), RTs longer than 1000 ms, time-outs (no response), and incorrect responses (pressing a key other than the correct spacebar), were first discarded from further analysis, which eliminated less than 2% of both schizophrenic and normal data. The mean RTs, standard deviations, and error rates for each block are presented for both groups in Table 2. The mean RTs as a function of congruency and SOA for each cue type for each group are illustrated in Fig. 2. ANOVA was then conducted, with a between-subject variable of group (schizophrenia, normal), and within-subject variables of cue-type (Arrows, Rectangles, Ellipses), cue-target congruency (congruent, incongruent, neutral) and SOA (100, 300, 700 ms). There was a significant main effect of group (slower RTs in schizophrenia) [$F(1,42)=4529.05$, $P<0.001$], cue-type (slowest for arrows) [$F(2,42)=48.68$, $P<0.001$], congruency (fastest in congruent conditions) [$F(2,42)=37.32$, $P<0.001$], and SOA (from the slowest to the fastest at SOA 100, 700, 300 ms) [$F(2,42)=176.16$, $P<0.001$]. The significant interactions were group × congruency [$F(2,42)=3.46$,

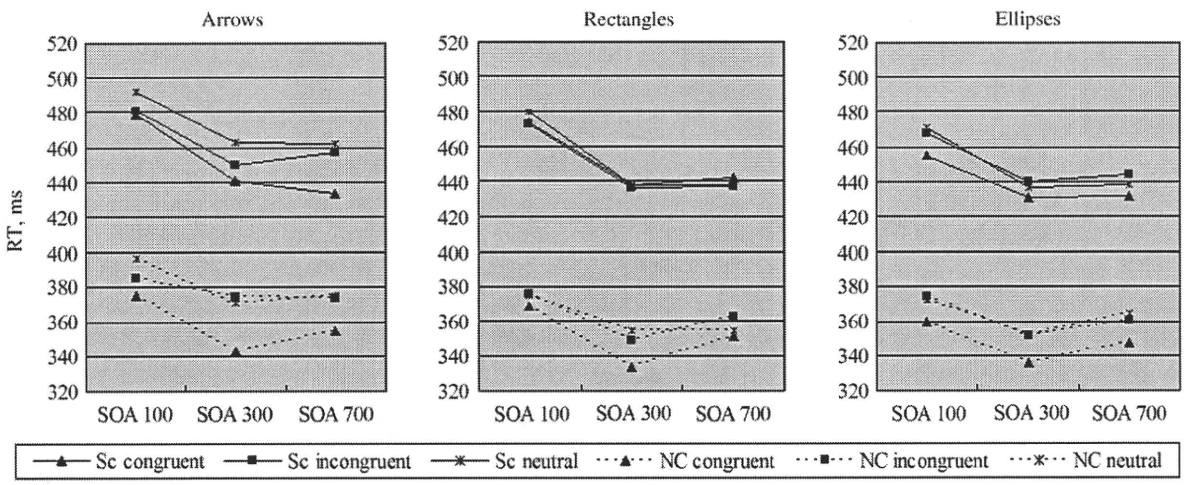

Fig. 2. Results of Experiment 1. The mean RTs of the schizophrenic group (Sc; lines) and normal controls (NC; dotted lines) for each cue type, as a function of cue-target congruency and SOA length.

$P=0.031$], group × SOA [$F(2,42)=13.01$, $P<0.001$], and cue-type × congruency [$F(4,42)=4.89$, $P=0.001$]. The significant interactions are further analyzed and detailed below.

To explore the critical interaction of congruency by group, separate ANOVAs were conducted for each group with congruency as the variable, which revealed a significant main effect of congruency for both schizophrenia [$F(2,21)=6.85$, $P=0.001$] and normal subjects [$F(2,21)=55.49$, $P<0.001$]. The group difference of congruency was further analyzed using Tukey's HSD within groups. The two groups demonstrated a similar pattern of congruency effect, in that RTs for congruent conditions were faster than both incongruent [schizophrenia; $P=0.046$, normal; $P<0.001$] and neutral [schizophrenia; $P=0.001$, normal; $P<0.001$] conditions. Thus, the magnitude of the benefit from congruent cues appears to be crucially different between the two groups. To quantify this difference, the benefit of congruent cues, defined as RTneutral–RTcongruent (positive values indicate benefits), and the cost of incongruent cues, defined as RTneutral–RTincongruent (negative values indicate costs), were calculated for each individual in both groups, using the mean RTs collapsed according to congruency (i.e., across SOAs) within each cue type. The averaged benefits and costs for both groups are illustrated in Fig. 3. Two-tailed t-tests comparing benefits between groups demonstrated no significant difference for Arrows [$t(42)=0.20$, $P=0.844$], a significant difference for Rectangles, [$t(42)=2.10$, $P=0.042$], and a trend for a difference for Ellipses [$t(42)=1.76$, $P=0.085$], reflecting smaller benefits of congruent gaze cues in schizophrenia. None of the cost differences were significant [Arrows: $t(42)=1.09$, $P=0.286$; Rectangles: $t(42)=1.38$, $P=0.176$; Ellipses: $t(42)=0.672$, $P=0.505$]. The interaction of congruency by group identified in ANOVA can thus be attributed to the reduction of congruency benefit in schizophrenia, which was evident for gaze cues (Rectangles, and to a lesser degree, Ellipses), but not for Arrows.

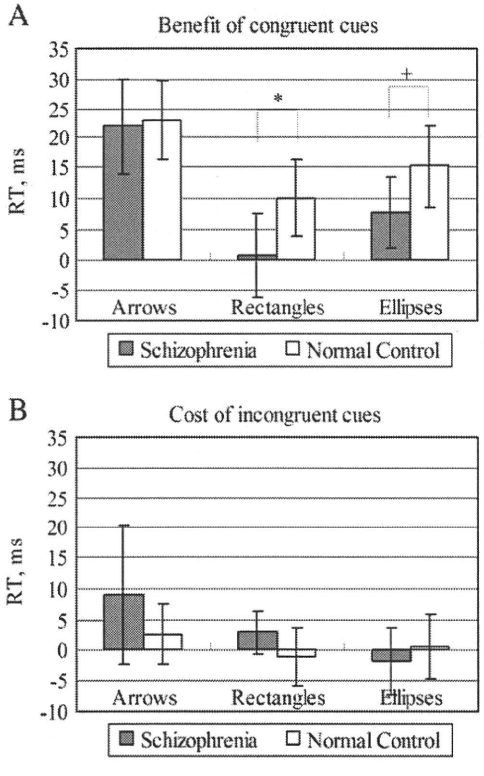

Fig. 3. Benefit of congruent cues and cost of incongruent cues. (A) The averaged benefit of congruent cues, calculated as RTneutral–RTcongruent, and (B) the averaged cost of incongruent cues, calculated as RTneutral–RTincongruent, are shown according to cue type and subject group. Positive (negative) values indicate benefits (costs). Error bars indicate the 95% confidence interval. *$P<0.05$, +$P=0.085$.

The interaction of congruency by cue-type was broken down by conducting separate ANOVAs for each cue-type with congruency as the variable. Arrows and Ellipses demonstrated significant effects of congruency [Arrows: $F(2,42)=25.57$, $P<0.001$; Ellipses: $F(2,42)=11.23$, $P<0.001$], while Rectangles did not [$F(2,42)=1.68$, $P=0.187$]. Although the interaction of group × cue-type × congruency did not reach significance, there appeared to be a group difference in the congruency effect for Rectangles (see Fig. 2). We therefore conducted a series of ANOVAs for each cue-type, with group and congruency as the variables. The interaction of group × congruency was not significant in any of the blocks, but approached significance for Rectangles [$F(2,42)=2.87$, $P=0.057$]. An additional series of ANOVAs for each cue-type and group was conducted, which revealed that the congruency effect for normal subjects was highly significant across cue-types [Arrows: $F(2,21)=30.70$, $P<0.001$; Rectangles: $F(2,21)=8.97$, $P<0.001$; Ellipses: $F(2,21)=18.80$, $P<0.001$], in contrast to schizophrenic subjects, who demonstrated a significant congruency effect only for Arrows [$F(2,21)=9.40$, $P<0.001$], with Ellipses approaching significance [$F(2,21)=2.93$, $P=0.053$], and no congruency effect whatsoever for Rectangles [$F(2,21)=0.207$, $P=0.813$]. The overall lack of a congruency effect for Rectangles can thus be attributed to a deficit in the schizophrenia group.

The interaction of SOA by group was also broken down by conducting separate ANOVAs for each group with SOA as the variable. Both groups demonstrated highly significant effects of SOA [schizophrenia: $F(2,21)=90.12$,

Table 3
Results of Experiment 2

Cue type	RT	S.D.	%E
Rectangles *	456	120	1.1
Rectangle-as-eyes	465	140	1.2

RT; reaction time (in ms), S.D.; standard deviation, %E; error rate.
* The results of the four patients who dropped out after Experiment 1 are eliminated; the same 18 participants as in Rectangle-as-eyes are evaluated.

$P<0.001$] [normal: $F(2,21)=102.81$, $P<0.001$]. Further analysis using Tukey's HSD revealed group differences in the SOA effect, such that schizophrenia demonstrated the slowest RTs for SOA of 100 ms, while RTs for SOA or 300 and 700 ms were essentially the same, whereas controls demonstrated RTs which were, from the slowest to the fastest, at SOA 100, 700, and 300 ms. The performance peak in schizophrenia appears to be at a longer SOA than the control subjects, indicating that this patient group might benefit from longer cue-target intervals than the controls.

Finally, the benefit differences and cost differences for each cue-type were tested for any correlation with the PANSS scores (positive, negative, and general psychopathology subscales, and total score), but none proved significant.

4. Discussion for Experiment 1

In a spatial cueing experiment using central gaze/arrow direction as cues, we have demonstrated that a relatively uniform population of chronic, medicated patients with schizophrenia differs from normal controls in terms of reduced benefit from congruently directed cues in detecting peripheral targets. Moreover, this benefit reduction in schizophrenia appears to be evident for gaze cues, but not for arrow cues. In other words, patients with chronic schizophrenia are compromised in orienting attention toward gaze direction, in the face of a relatively normal orienting for arrows. However, there is one major caveat to this experiment that needs to be addressed; the reduced congruency benefit in schizophrenia was mainly driven by the ambiguous rectangular eyes. The complete lack of congruency benefit seen in schizophrenia for the rectangles might just be reflecting the fact that schizophrenic subjects, as concrete perceivers simply do not perceive the rectangles as eyes; thus, such a cue cannot be considered a 'gaze' cue for schizophrenia in the first place. To overcome this caveat, we made further investigations in Experiment 2.

5. Experiment 2

5.1. Methods for Experiment 2

In this experiment, we tested the same patients who had completed Experiment 1, in an additional block of Rectangles. The only difference from the Rectangles in Experiment 1 were the instructions given before the trial. Subjects were first asked what they perceived of the rectangles. When they were unable to spontaneously perceive the rectangles as eyes, they were explicitly instructed to perceive them as such throughout the block. Such instructions should eliminate the possibility of a failure in schizophrenic subjects to perceive the rectangles as eyes. Additionally, this block would give us an opportunity to directly compare the performance for rectangles whose resemblance to gaze was not explicitly mentioned with the performance for rectangles that were explicitly instructed to be perceived as eyes. The interest lies in whether such explicit instructions are effective in normalizing behavior in chronic schizophrenia, such that a top-down regulation now allows them to infer the biological directional information from the rectangles.

5.2. Subjects

Of the 22 schizophrenic patients in Experiment 1, 18 patients participated in this experiment. One patient

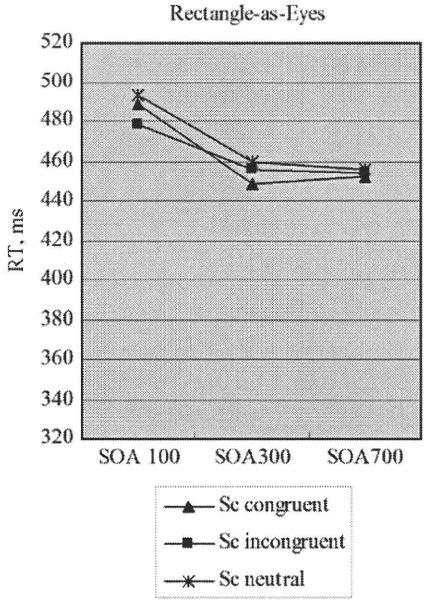

Fig. 4. Results of Experiment 2. The mean RTs for the schizophrenic group are shown as a function of cue-target congruency and SOA length.

dropped out due to an exacerbation of psychosis, two inpatients had returned home after Experiment 1, and one patient refused to participate.

5.3. Stimuli

Exactly the same stimuli were used as the Rectangles in Experiment 1.

5.4. Procedure

The procedure was essentially the same as the Rectangles in Experiment 1, except this time, the subjects were asked, during the practice trials, what the rectangles looked like. When they were unable to spontaneously perceive the rectangles as eyes, they were encouraged to perceive them as such, and were asked if they were successful. Finally, they were explicitly instructed to perceive the rectangles as eyes throughout the block. Therefore, practice trials were not limited to 15, but were continued until the patients fully understood the instructions.

6. Results for Experiment 2

Of the 18 participants, two patients were unable to spontaneously perceive the rectangles as eyes. The two reported the stimulus concretely as 'a black square within a white rectangle'. When encouraged to perceive them as eyes, both subjects immediately reported that they were able to.

The mean RTs, standard deviations, and error rates of all participants in Experiment 2, and of the same 18 participants in the Rectangles of Experiment 1, are presented in Table 3. An ANOVA was conducted with condition (with or without explicit instruction), cue-target congruency (congruent, incongruent, neutral), and SOA (100, 300, 700 ms) as the variables. There was a significant main effect of condition (slower RTs with instruction) [$F(1,17)=8.05$, $P<0.005$] and SOA (slowest at SOA 100 ms) [$F(2,17)=50.54$, $P<0.001$], but the effect of congruency was non-existent [$F(2,17)=0.86$, $P=0.421$]. None of the interactions were significant. Further analysis confirmed that there was no congruency effect even when the conditions were evaluated separately, or when evaluated separately for each SOA. Fig. 4 illustrates the mean RTs in Experiment 2, as a function of congruency and SOA.

To ensure that the confounding factor of perceptive failure had been eliminated, an ANOVA was conducted with only the 16 participants who were successful in spontaneously perceiving the rectangles as eyes. There was a significant main effect of SOA (slowest at SOA 100 ms) [$F(2,15)=45.29$, $P<0.001$]. The congruency effect was again non-existent [$F(2,15)=0.83$, $P=0.434$]. None of the interactions were significant. Further analysis confirmed that there was no congruency effect even when the conditions were evaluated separately, or when evaluated separately for each SOA.

7. Discussion for Experiment 2

Even when the schizophrenic subjects were certainly successful in organizing the intended percept from the rectangles, as evidenced by spontaneous reporting, rectangles failed to elicit a congruency benefit. Thus, the benefit decrease from congruent rectangular eyes in schizophrenia cannot be attributed to perceptive deficits. Rather, patients with schizophrenia can actually perceive gaze-like stimuli as eyes, but fail to utilize the biological information in orienting their attention. In sum, Rectangles failed to elicit a congruency benefit despite practice, explicit instructions, and even successful perception in subjects with chronic schizophrenia.

8. General discussion

In the present two experiments, we have demonstrated that congruency benefit is reduced in long-term schizophrenia in a spatial cueing paradigm using central directional cues. This reduction of congruency benefit was most prominent for the ambiguous gaze cues, tentatively present for the concrete gaze cues, but non-existent for the non-biological arrow cues. The prominent benefit reduction for the ambiguous gaze cues was not attributable to a perceptive failure, but more likely attributable to a failure in extracting the critical information from the perceived eyes. This finding, though subtle, is indicative of a gaze-specific hyposensitivity in chronic schizophrenia.

In a recent report, Langdon et al. (2006) have made similar investigations with a group of diverse schizophrenic subjects, and have shown that they might be hypersensitive to gaze cues, in terms of a very early facilitatory effect of gaze observed in their patients compared with controls. This effect was not replicated in our experiment. Two major differences between their experiments and ours are most likely to be responsible for the discordant results: 1. The nature of the stimulus used was different. Langdon et al.'s stimuli employed photographs with two directional components (head and gaze), as opposed to the stimuli used in our study which were pictorial and strictly specific to gaze. 2. The profile of the patients was different. The range of the duration

of illness in Langdon et al.'s patients was 1–26 years, relative to 13–45 years in our study. As has been mentioned, most schizophrenic symptoms, including that of gaze, are surprisingly state-dependent. In the extreme case such as the sensitivity to gaze, the symptom might completely reverse itself from the acute to the chronic state. The necessity of demarcating its state when investigating schizophrenia has been demonstrated in identical spatial cueing experiments using peripheral cues; the behavior pattern in the acutely ill stage of schizophrenia differed from all other schizophrenic states (Posner et al., 1988; Carter et al., 1992; Maruff et al., 1995; Wigal et al., 1997).With regard to the subjects who participated in Langdon et al.'s experiments, they were quite diverse as to the duration of illness. Patients both acutely sensitive to gaze, and bluntly unresponsive to gaze, might have been mingled in such a group. It is quite conceivable that Langdon et al. might have captured a more acute state of the symptoms than we have. On the other hand, we believe we have extracted a behavior pattern strictly specific to gaze, and also specific to chronic schizophrenia.

However, some non-significant but intriguing consistency with Langdon et al.'s study is also present. The contrast between the schizophrenic performance of Arrows and Ellipses might be of relevance. Our schizophrenic group demonstrated a trend for a congruency effect for the Ellipses, which appears to be equally present from SOA 100 ms throughout 700 ms (note that this is also the case for the normal controls in our study, contrary to that of Langdon et al.). On the other hand, the significant congruency effect for Arrows in schizophrenia appears to grow from SOA 100 ms to 700 ms (note, however, that this congruency × SOA interaction was not significant). Such a contrast in the time-course of the congruency effect might indicate an early orienting of attention to gaze cues relative to arrow cues in schizophrenia, and might dovetail with the results of Langdon et al.'s study.

Taken together repeated findings of smaller volume STG in schizophrenia (Rajarethinam et al., 2000, 2004; Onitsuka et al., 2004), the gaze-specific hyposensitivity that we have demonstrated in this study might be reflective of STS dysfunction in schizophrenia. Indeed, we have previously demonstrated, in a selective right STG damaged case, a deficit in gaze-triggered orienting despite a sparing of arrow-triggered orienting (Akiyama et al., 2006b), a pattern similar to that of chronic schizophrenia in the present study. The possible transition from an early hypersensitivity to a later hyposensitivity toward gaze in schizophrenia is consistent with the clinical picture of the disorder, and might be indicative of the nature and the time-course of brain dysfunction associated with it. Several studies of the brain of childhood-onset schizophrenia, a severe variant of schizophrenia, have demonstrated normal (Thompson et al., 2001) or even relatively increased STG volume (Jacobsen et al., 1996; Taylor et al., 2005) at the onset of the disease, which then progressively decreases (Jacobsen et al., 1998) to a subnormal degree within a course of 5 years (Thompson et al., 2001). Since childhood-onset schizophrenia is considered an ideal patient group in revealing the neurodevelopmental disturbance which underlies the later-onset counterpart of schizophrenia, such a finding in the time-course of the STG volume might be helpful in interpreting the hyper/hyposensitivity to gaze seen in later-onset schizophrenia. For example, in the acute phase, when there is yet no gross STG volume loss, the earliest disintegration might begin, resulting in a heightened aberrant activity in the STS, and manifesting as a hypersensitivity to gaze. STG volume might then decrease in the patient's course into chronicity, dulling STS activity and resulting in a hyposensitivity to gaze. Correlating STG volume and behavioral results such as Langdon et al.'s and our experiments in future studies might offer fruitful insight into the time-course of schizophrenia.

The group differences in the effect of SOA on performance seen in this study, such that schizophrenic performance peaks at a longer SOA than the performance of normal subjects, might be reflective of some basic compromise in schizophrenia. Slower visual processing, motor slowing, and restricted attentional resources due to psychomotor retardation inherent to the disorder, and/or as an effect of neuroleptic medication, might be some of the factors that demand longer cue-target intervals for optimal performance in schizophrenia.

The effect of stimulus ambiguity on performance, although not the main focus of this study, is nonetheless an interesting issue. The difference between Rectangles and Ellipses used in this experiment can be defined as the ambiguity of their resemblance to eyes. Both schizophrenic and normal groups demonstrated a weaker congruency effect for the more ambiguous (or less ecological) rectangular eyes, indicating some effect of stimulus ambiguity on performance. However, the congruency effect was still highly significant for both Rectangles and Ellipses in the normal group, whereas no such congruency effect was present for Rectangles in schizophrenia. Stimulus ambiguity might have a stronger impact on patients with schizophrenia, perhaps reflecting their concreteness in perception. On the other hand, the absence of a congruency effect for Rectangles in schizophrenia was replicated even when the subjects were able to spontaneously perceive them as eyes, ruling out the possibility of a

simple perceptive failure. Instead, it is suggestive of a specific failure in orienting attention according to the successfully perceived eye-gaze. It is also important to note that patients with schizophrenia demonstrated a trend for a benefit reduction for the very concrete, elliptical eyes as well, emphasizing that their benefit reduction from congruent gaze cues cannot be attributed solely to their difficulty with ambiguous stimuli.

Gaze cognition is pivotal in social interaction, in that it enables us to decipher the inner thoughts of others from the direction of their attention. Any form of compromise would be devastating to the victims. The social inadequacy often seen in patients suffering from chronic schizophrenia might in part be attributable to the compromise in gaze cognition such as demonstrated in the current study. A deeper understanding of the symptoms related to gaze in schizophrenia might offer some strategy to rescue from their social isolation.

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Short Report

Knowledge and impressions regarding the concept of mutation among Japanese university students

Ando N, Saito Y, Takemura K, Takada F, Iwamitsu Y. Knowledge and impressions regarding the concept of mutation among Japanese university students.
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Although the term *mutation* is frequently used in genetic counseling, it may carry negative connotations and create misunderstanding. Our objective was to investigate the relationship between the impressions regarding three Japanese terms *mutation of gene*, *change of gene*, and *lesion of gene* as well as to investigate the depth of understanding regarding mutation. A total of 175 university students and auditing students were included and responded to two questionnaires that were *Impressions regarding the term* in the semantic differential method and *Knowledge about the concept of mutation*. In factor analysis, three factors (Value, Change Rate, and Intention) were extracted. Participants were divided into three groups depending on their knowledge, and a two-way analysis of variance (Term × Knowledge Group) was conducted on the factor score for each. Results showed that the main effect of the 'Term' was significant for the Value Factor and that interaction was significant for the Change Rate Factor, and that the main effect of Knowledge Group was significant for the Intention Factor. The findings suggest that healthcare professionals should demonstrate an awareness of varying impressions of the different terms used to refer to the identical concepts of mutation. This is of particular importance when communicating with patients and their families.

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Key words: education – genetic counseling – health communication – knowledge – mutation – public understanding of science

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Significant new knowledge regarding the biological basis of heredity and the genetics of human traits has accumulated during the past 100 years. As discoveries continue to be made about genetic factors in diseases, it is anticipated that genetic-based medicine will become more routine in future clinical settings (1). With the development of medical genetics, geneticists and genetic counselors are increasingly providing genetic information to clients and helping them to adapt to the medical, psychological and familial implications of genetic contribution to disease (2) using unfamiliar technical terms.

It has been shown that medical and biological terms used in medical examinations are widely misunderstood by many lay people (3–6) and that this is also similar with genetic terms and concepts (7). The term *mutation* is frequently used in genetic counseling, but mutation is a complicated concept that may carry negative connotations. The primary meaning of mutation is 'the action or process of changing (8)'. This definition is neutral and simply means changing biologically and physically. However, through time, the term *mutation* has become increasingly negative in its connotations, particularly because of the general fear of nuclear radiation in the public mind and the direct association between this fear and genetic mutation (9). A study on the bias against the four terms *mutation*, *variation*,

alteration, and *change* has revealed that most people had a strongly negative bias against the term *mutation* that was perceived as being an unintended change, whereas the term *alteration* was perceived as being an intended change (10). The authors suggested that healthcare professionals avoided using the term *mutation* when informing patients and families that they, or their offspring, carried a disease-associated allele. In an Australian study, some participants found the term *mutant gene* offensive and suggested that the careful choice of words might reduce the risk of labeling and stigmatization as well as prevent unnecessary anxiety (11). These results have highlighted that the term *mutation* has a negative connotation and have suggested that healthcare professionals should demonstrate awareness when using the term *mutation*.

Our objective was to investigate the relationship regarding the impression of three Japanese terms *mutation of gene*, *change of gene*, and *lesion of gene* (all having a similar meaning in Japanese) as well as to investigate the depth of understanding regarding mutation.

Materials and methods

Participants

Participants were 193 students in the Faculty of Arts at Kitasato University and Social Psychology at Waseda University who participated voluntarily. Of these, 188 responded to our questionnaire. We excluded four participants who had healthcare professional experiences and nine who filled out the questionnaires incompletely. Therefore, a total of 175 undergraduate and auditing students were included in this study (male: $n = 62$, female: $n = 113$, age: mean = 19.8 years, SD = 3.0 years, and range: 18–54 years).

Questionnaires

Impressions regarding the terms

The three Japanese terms (*mutation of gene*, *change of gene*, and *lesion of gene*) were rated on 14 dimensions using a semantic differential scale with adjective sets (5-point scale). Before preparing the questionnaire, 18 lay people and 7 healthcare professionals (doctors, nurses, clinical technologists and speech therapists) were asked about their impressions regarding six Japanese terms (*mutation*, *change*, *lesion*, *mutation of gene*, *change of gene*, and *lesion of gene*; the last three terms have a similar meaning in Japanese). We selected 14 adjective sets based on these responses as well as adjectives that were used by Condit et al. (10). The 14 selected adjective sets were good/bad, sudden/not sudden, changing/unchanging, evolved/degenerated, normal/abnormal (not normal), natural/unnatural, avoidable/unavoidable, healthy/unhealthy, intended/unintended, adapted/maladapted, scary/not scary, desirable/undesirable, fast/slow and able to develop/unable to develop. Values given were 5 for the adjectives on the left and 1 for the adjectives on the right.

Knowledge about the concept of mutation

Thirteen items were designed to measure knowledge regarding the basic concept of mutation. Four of 13 items were original questions based on high school biology textbooks approved by the Japanese Ministry of Education, and 9 of 13 items were questions that were used by Condit et al. (10). Participants were asked to respond to the 13 questions by choosing one of the three responses (*true*, *false*, and *I don't know*). Value of 1 was given for correct answer (*all true*) and 0 for the others.

Procedure

Participants were asked to anonymously rate their impressions regarding the three terms and to complete a questionnaire concerning the basic concept of mutation. The three terms were indicated randomly in the *Impressions regarding the terms* questionnaire to counterbalance the order effects. The procedure of the study was approved by institutional review board.

Data and statistical analyses

Firstly, the percentage of correctly answered questions and the mean and standard deviation (SD) of the total number of questions answered correctly in the knowledge assessment questionnaire were calculated. Secondly, to reveal the factor structure of the three terms that connoted the same concept of changes in genetic information, we performed a factor analysis (varimax rotation) on impressions regarding the three terms. Finally, we calculated the percentage of questions answered correctly to assess the knowledge of the participants regarding mutation, and they were divided into three groups based on the total score for knowledge about mutation: low-knowledge group ($n = 53$, 3–7 correct answers), middle-knowledge group ($n = 51$, 8–9 correct answers) and high-knowledge group ($n = 71$,

10–13 correct answers) based on the 33.3 percentile (8 questions answered correctly) and the 66.7 percentile (10 questions answered correctly). To reveal whether knowledge about mutation had an effect on the impressions of the three terms, a two-way analysis of variance (ANOVA) [Term (*mutation of gene*, *change of gene*, and *lesion of gene*) × Knowledge Group (low, middle, and high)] was conducted on the factor score of each. Data analyses were performed using SPSS statistical software version 15.0.

Results

Knowledge about the basic concept of mutation

The mean of correctly answered questions was 8.77 (percentage of correct answer: 67.7%) and SD was 2.24. The percentage of correct responses to each question in this study in comparison to Condit et al.'s study is shown in Table 1 (10). It can be seen that the correct response rate for 10 of 13 question statements was above 64.0%. However, correct response rates to the statements, 'changes in genes can occur over a lifetime', 'changes in genes can be caused by the sun', and 'changes in genes of somatic cells cannot be inherited' were below 37.1%.

Factor structure of the three terms *mutation of gene*, *change of gene*, and *lesion of gene*

Firstly, to reveal the factor structure of the three terms, an unconstrained factor analysis for the number of factors was conducted dependently for the three terms. Three factors were extracted for the three terms, and the cumulative rate was 44.7% (Table 2). Factor 1 was interpreted as positive–negative connotations and was named the Value Factor. Factor 2 was interpreted as changing rate and was named the Change Rate Factor. Factor 3 was interpreted as going as planned and was named the Intention Factor. Cronbach's alpha scores for each factor were 0.87, 0.48 and 0.62, respectively.

Knowledge effect on the impression of the three terms

To reveal whether knowledge about mutation had an effect on impressions regarding the three terms, two-way ANOVA [Term (*mutation of gene*, *change of gene*, and *lesion of gene*) × Knowledge Group (low, middle, and high)] was conducted on the factor scores for each extracted factor. A significant main effect of Term was observed for the Value Factor ($F_{2,344} = 212.4$, $p < 0.01$). Post-hoc analysis (Bonferroni method) revealed that the factor score of the Value Factor for *lesion of gene* was significantly higher than those for *mutation of gene* and *change of gene* and that the factor score for the Value Factor of *change of gene* was significantly lower than those for *mutation of gene* and *lesion of gene* (Fig. 1a). The interaction of the Change Rate Factor (Term × Knowledge Group) was significant ($F_{4,344} = 3.619$, $p < 0.01$). The simple main effect of Knowledge Group on *mutation of gene*

Table 1. Understanding of the basic concept of *mutation*: the percentages of correct responses for each question are shown

Question	Question statements	Percentage of questions answered correctly	
		This study, $n = 175$	Condit et al.'s study (10), $n = 848$
Q1	Changes in your genes can be inherited[a]	78.9	81.0
Q2	Changes in genes can lead to disease[a]	92.6	83.1
Q3	Changes in genes can be caused by radiation[a]	88.6	76.2
Q4	Changes in genes can be caused by chemicals[a]	71.4	77.0
Q5	Every gene is able to mutate or change[a]	80.0	69.2
Q6	Chemicals can change the genes in the sperm of a man[a]	68.0	75.9
Q7	Chemicals can change the genes in the reproductive eggs of a woman[a]	65.1	76.6
Q8	Changes in genes can be spontaneously caused at a constant frequency[b]	64.0	
Q9	Changes in genes can occur over a lifetime[a]	27.4	63.3
Q10	Changes in genes can be caused by the sun[a]	37.1	41.6
Q11	Changes in genes of somatic cells cannot be inherited[b]	32.0	
Q12	Changes in genes concern biologic evolution[b]	88.0	
Q13	Some changes in genes cannot lead to disease[b]	84.0	
Percentage of common questions answered correctly		67.7	71.5

[a]Cross-questions with Condit et al. (10).
[b]Original questions in this study.

Table 2. Factor loading of *mutation of gene*, *change of gene*, and *lesion of gene* (varimax rotation): the values in bold indicate the items that loaded on each Factor

	Factor 1, Value	Factor 2, Change Rate	Factor 3, Intention	Communality
Good/bad	**0.836**	−0.040	−0.036	0.701
Healthy/unhealthy	**0.747**	−0.177	−0.103	0.600
Desirable/undesirable	**0.743**	−0.206	−0.024	0.595
Adapted/maladapted	**0.676**	0.027	−0.040	0.459
Scary/not scary	**0.619**	−0.333	−0.063	0.498
Normal/not normal	**−0.615**	0.268	0.034	0.452
Evolved/degenerate	**0.599**	−0.299	0.195	0.485
Natural/unnatural	**0.586**	0.131	0.039	0.361
Able to develop/unable to develop	**0.465**	0.130	0.022	0.233
Sudden/not sudden	−0.101	**0.577**	0.049	0.346
Fast/slow	−0.371	**0.474**	0.008	0.362
Changing/unchanging	0.239	**0.395**	0.163	0.240
Avoidable/unavoidable	0.027	0.094	**0.719**	0.526
Intended/unintended	−0.075	0.048	**0.627**	0.402
Cumulative percent (%)	29.681	37.592	44.723	

was also significant ($F_{2,172} = 7.202$, $p < 0.01$). That is, the middle- and high-knowledge groups had a significantly higher score than the low-knowledge group (Fig. 1b). Concerning the Intention Factor, the main effect of Knowledge-Group was significant ($F_{2,172} = 7.909$, $p < 0.01$). The low-knowledge group had higher factor scores for the Intention Factor (Fig. 1c) than the middle- and high-knowledge groups (Fig. 1c).

Discussion

Knowledge about the basic concept of mutation

Participants' knowledge about the basic concept of mutation was significantly different for each question, with the correct response rate ranging between 92.6% and 27.4%. The correct response rate for 10 of 13 questions was above 64.0% and that for 3 of 13 questions was below 37.1%. When compared with Condit et al.'s results (10), the correct response rates to the nine questions that were common to the two questionnaires were similar. However, close examination of details revealed differences in responses to Q9 (changes in genes can occur over a lifetime), and the rate of correct response for Q9 in our study (27.4%) was lower than that of Condit et al.'s study (63.3%) (10). The low correct response rate for Q10 and Q11, observed in both studies, indicated that lay people had little knowledge regarding somatic mutation. These results also indicated that Japanese university students in our study had less knowledge of somatic mutation compared with American students who participated in Condit et al.'s study. A comparison of Japanese and American high school biology textbooks indicated that American biology textbooks contain more information about genetics than Japanese textbooks (12, 13). In particular, American biology textbooks included information on cancer genetics and human genetics, but this was not the case in Japanese books. These facts suggested that the quality of biology

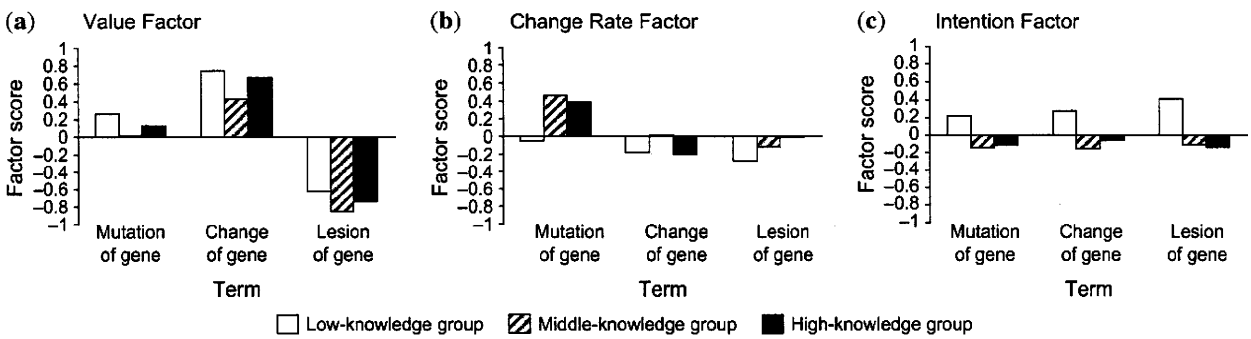

Fig. 1. Factor scores of *mutation of gene*, *change of gene*, and *lesion of gene*: means of the factor scores for the three terms in each knowledge group are shown.

education affected knowledge of genetics. Moreover, new educational guidelines from the Japanese Ministry of Education (2003) have deleted the topic of mutation from Biology Course 1 taken by many high school students. There is concern that lay people have impediments to understanding genetic diseases caused by mutation, which is a central point in genetic counseling. Moreover, it is essential to have knowledge regarding somatic mutation because cancers are often caused by somatic mutation. Knowledge regarding somatic mutation is very important when we consider genetic counseling for familial cancers.

Some studies assessing knowledge of genetics among lay people have revealed that knowledge of lay participants (14–16), patients (17) and their spouses (18) was limited. Moreover, even physicians, with the exception of geneticist (19, 20), had insufficient knowledge of genetics. Knowledge on genetics in physicians and lay people has become necessary because of the recent Human Genome Project as well as because of the discovery that genetic knowledge is helpful for human healthcare.

Factor structure of the three terms *mutation of gene*, *change of gene*, and *lesion of gene*

As the result of factor analysis, three factors were extracted for the three terms: Value Factor contained the general positive–negative concept, Change Rate Factor contained the static–dynamic concept and Intention Factor contained the accidental–intentional concept.

Results of two-way ANOVAs (Term × Knowledge Group) suggested different impressions of the three Japanese terms for the concept of mutation: *mutation of gene*, *change of gene*, and *lesion of gene*. Firstly, *lesion of gene* in Japanese had the most negative impression without relation to knowledge on Value Factor. According to the Japanese dictionary (21), the term *lesion* has the meaning of (i) physical damage or psychological damage, (ii) breach, break, cleft, fissure, fracture or split line, (iii) fault or imperfection and (iv) abasement, shame or disgrace. The term *lesion* (in Japanese: *Kizu*) includes concepts relating to physical wounds and also mental trauma. It seems that the negative impression of the term *lesion of gene* depended on the fundamental negative impression of the term *lesion* (*Kizu*). Japanese healthcare professionals might think that it is easy for lay people to understand mutation by using the term *lesion of gene* during genetic counseling, or at a heredity clinic, because *Kizu* is a familiar term for lay people. But using a negative term might lead to psychological distress for clients with anxiety and stress who are recipients of genetic counseling (22). Healthcare professionals giving genetic counseling to clients and working in heredity clinics should keep in mind that clients and patients might have a negative impression of the term *lesion of gene* regardless of their knowledge. The Japanese term for *change of gene* resulted in the most positive impression without relation to knowledge on Value Factor, probably because the term *change* has a neutral impression.

Secondly, an interaction between Term and Knowledge was observed on Change Rate Factor such that the low-knowledge group had a lower impression of *sudden*, *fast*, and *changing* with *mutation of gene* on Change Rate Factor because *Totsuzen*, in the Japanese term for *mutation* (*Totsuzen-Hen'i*), means sudden. Japanese high school biology textbooks teach about the concept of mutation (*Hen'i*) by using *Kankyo-Hen'i* (environmental variation) and *Totsuzen-Hen'i* (gene mutation and chromosomal mutation), so it appears that middle- and high-knowledge groups had an impression of the term *Hen'i* that included sudden.

Finally, data on the Intention Factor indicated that the low-knowledge group perceived mutation as being more intentional compared with the middle- and high-knowledge groups, suggesting that the middle- and high-knowledge groups held a stronger belief that mutation is a natural phenomenon and therefore is unavoidable in comparison to the low-knowledge group. Condit and O'Grady (23) have explored interpretations of the term *mutation* held by lay and expert audiences. Both groups regarded mutations as being a variation but not as a planned or an intentional one. Experts regarded mutations as being necessary and not as being undesirable, whereas the lay group tended to be significantly less likely to see mutations as being necessary or as desirable. That the factor score for the Intention Factor, including intended/unintended and avoidable/unavoidable, was affected by knowledge about mutation suggests that the intentional impressions of the term *mutation* might be different in lay people. Differences of knowledge regarding the concept of mutation might affect the acceptance of the process of genetic diseases. Iwamitsu (24) has stated that it was important for patients and their families to be provided with at least a minimum amount of medical information about their diseases as soon as possible. This is also true in the area of genetic counseling and educational intervention.

Regarding the term *mutation*, the relationship between the image of genetics and the depth of understanding regarding genetics should be noted. However, there are a few reports regarding the image of genetics in relation to knowledge about genetics. Genetic developments have been found to evoke both positive and negative feelings in public and professional groups, but with the public being less positive overall than the professionals (25). That study compared lay people with experts; however, there are no studies that have investigated differences between different groups of lay people with different degrees of knowledge.

The usage of the term *mutation* is problematic as a scientific word because of the confusion regarding its use (26). Along with the popularization of genetic testing, in clinical practice, this confusion might result in confusion in the understanding of lay people. It is a very important clinical issue that public understanding and attitudes regarding genetics affect the attitudes of lay people regarding genetic testing. As a whole, lay people (including patients and caregivers) with a high level of knowledge about genetics had more positive attitudes about genetic testing (27–33), but higher levels of knowledge about genetics were also related to negative attitudes (33). Geneticists and genetic counselors should provide accurate information to their clients after taking into consideration how the term should be used in order to encourage the acceptance of genetic testing. Moreover, not only it is important for healthcare professionals to provide accurate information but also they should check with clients about the meaning that the terms used have for each individual. These considerations may be helpful for better communications between clients and healthcare professionals.

Limitation and perspectives

In this study, we suggested that the three Japanese terms *mutation of gene*, *change of gene*, and *lesion of gene* have different impressions, although they have similar meanings. In previous studies, certain terms including 'change', 'variation', 'version of gene' (10), 'faulty gene', 'altered gene' (11), and 'functionally challenged gene' (23) have been proposed as alternatives to the term *mutation*, which has a negative impression. In the study on communicating with cancer patients, Dunn et al. (34) showed that exposure to the word 'cancer' in a questionnaire, as opposed to the word 'illness', increased anxiety of these patients about the use of euphemism. However, they also described that the use of the word 'cancer' did not affect psychological adjustment, and it might have enabled patients to think about their cancer realistically. As is the case with genetic counseling, the term *mutation* is the accurate term for change in genetic information. We should discuss how to reduce ambiguity in genetic terms and become aware of using the term *mutation* in the clinic.

This study has several limitations that should be noted. The findings suggest that there were significant insights even in the limited participants consisting of Japanese university students and auditing students who agreed to participate in this research. There are several clinical implications of the present findings, but further research on the impressions of the term *mutation* on patients with genetic diseases and their families is needed to understand more useful implications for genetic counseling. Erblich et al. (35) have demonstrated that women with the stress of having a family history of breast cancer exhibited more interference on a stroop task with cancer-related stimuli compared with women without a family history of cancer, although this bias was not mediated by the significantly higher perceived risk, general distress, or cancer-specific distress in women with a family history of cancer. Constans et al. (36) have suggested that the level of heart-related worry and emotional distress in myocardial infarction (MI) patients were not associated with the degree of attention bias to cardiac stimuli in the post-MI participants but were associated with their monitoring coping style. These findings suggested that maladaptive alterations in processing of disease stimuli might have important clinical implications. This is particularly the case with genetic disease patients and their families who must process complex genetic-related information critical to their health.

In conclusion, when applied to the area of genetic counseling, the findings of this study suggest that healthcare professionals should demonstrate an awareness of the different terms that are used to refer to the identical concept of mutation. This is of particular importance when communicating with patients and families.

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資料

意思決定における“日本版後悔・追求者尺度”作成の試み[1]

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Construction of a Japanese version of the “Regret and Maximization Scale” in decision making

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This study developed a Japanese version of the “Regret and Maximization Scale” in decision making, which was originally constructed by Schwartz, Ward, Monterosso, Lyubomirsky, White, and Lehman (2002). This scale measures assess the tendency to experience regret, and individual differences in the desire to maximize or to satisfy. In Study 1, the original version of the “Regret and Maximization Scale” was translated into Japanese and administered to 307 Japanese university students responded the scale. Factor analysis did not replicate the finding of Schwartz et al. (2002). In Study 2, we developed new items, and constructed a “Japanese Version of the Regret and Maximization Scale”, based on the interpretation of the factor analysis in Study 1. This new version of the scale was administered to 163 Japanese university students. The result of factor analysis and reliability analysis indicated that this “Japanese Version of the Regret and Maximization Scale” had a considerably high Cronbach’s alpha and conceptual validity.

Key words: decision making, maximization, satisfaction, regret, Regret and Maximization Scale.

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消費者の意思決定を理解する上で経済学などの社会科学においては，期待効用理論（von Neumann & Morgenstern, 1947; Savage, 1951）による解釈がよく用いられる。この理論の背後には，意思決定に際して人間は合理的であり合理性を示す一群の選好関係の基準を満たすという仮定が含まれている。意思決定者がこの一群の選好関係に関する公理を満たすなら，この選好関係は期待効用理論では効用（utility）を最大化することと等価になる。

しかしこれまでの意思決定研究は，人間が期待効用理論の公理や条件に反する選好関係を示すことを明らかにしている（Allais, 1953; Kahneman, 2003; 竹村, 2005, 2006）。特に Simon（1955）は意思決定者は情報処理能力の限界から，全ての選択肢を正確に把握することは不可能であることを指摘した。意思決定者は限定された能力や時間の中で自らが満足（satisfying）可能な最低限の基準である満足化基準を満たす選択肢を選ぶ。

また，意思決定において個人の感情を考慮に入れる動きが見られる。Bell（1982）や Loomes & Sugden（1982）は，人間は実際の結果と他の選択肢を選んだ場合に得られる結果とを比較して後悔を回避する選択肢を選ぶことを導出した。

これらの知見をもとに，Schwartz, Ward, Monterosso, Lyubomirsky, White, & Lehman（2002）は自ら作成した“後悔・追求者尺度（Regret and Maximization Scale）”の因子分析研究によって，意思決定スタイル

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[1] 本論文は，第一著者及び第二著者が 2004 年度早稲田大学総合人文学科心理学専修卒業論文として提出したものを加筆修正したものである。また本研究の一部は日本感性工学会第 7 回大会において発表された。

[2] 本論文の作成にあたり，早稲田大学大学院大久保重孝氏，井出野尚氏，田中健一氏，丹波秀夫氏に数々の貴重なコメントをいただきました。また本研究にご協力いただいた株式会社マーケッティング・サービスの岡崎徹氏，早稲田大学文学部伊藤愛美氏，西野友加里氏，調査にご回答くださった学生の皆さんに深く感謝いたします。

を二種類に分類した。第一は効用を最大化する選択肢を選ぶことを目的とする追求者（maximizer）[3]，第二は満足化基準を満たす選択肢を選ぶことを目的とする満足者（satisficer）[4]である。追求者は最良の結果を手に入れることを，満足者は程々に満足できる結果を手に入れることを目的とした意思決定を行う（Schwartz, 2004 千葉・編集部訳 2004）。

Schwartz et al.（2002）によると，追求者は効用を最大化する意思決定を行うためあらゆる選択肢の情報を集めようとする。しかし人間の処理能力には限界があるため，選択肢数が増加するほど最大化に要するコストが増加し最終的な効用が低下する。追求者は実際に入手した結果と今回入手しなかった結果を比較して，後者に対する後悔を増大させる。他方満足者は限定された能力や時間の中で最低限の基準を満たすことを目的とするため，最初に満足化基準を満たした選択肢を選択する。満足者は追求者と異なり，全ての選択肢を精査することを好まない。従って満足者は追求者に比べて，今回入手しなかった結果に対する後悔が少ない。実際に Schwartz et al.（2002）の作成した“後悔・追求者尺度”では，“後悔尺度（Regret Scale）”と“追求者尺度（Maximization Scale）”に正の相関が認められた。

Schwartz et al.（2002）は自ら作成した尺度と多数の尺度との相関を求めた。その結果第一に，追求者と抑うつ，完璧主義には正の相関が，幸福感，楽観主義，生活への満足感，自尊感情には負の相関があることが見出された。第二に，追求者は満足者と比べて商品購入後の満足度が低いことが示された。第三に，追求者は自分の選んだ選択肢と他人の選んだ選択肢を比較することが明らかになった。第四に，追求者は満足感情よりも後悔感情を示しやすいことが認められた。

Schwartz et al.（2002）の作成した尺度では，アメリカやカナダ在住者を調査対象としており日本人における知見は必ずしも見出されていない。そこでまず研究 1 では，Schwartz et al.（2002）が作成した“後悔・追求者尺度”を日本語に翻訳して調査を実施し検討を行う。次に研究 2 では，この分析結果に基づいて日本人にも適用可能な意思決定スタイルを測定する尺度を作成し内容を吟味する。

[3] 意思決定の分野では，maximization は“最大化”と訳されている。従って maximizer は“最大者”とするのが妥当だが，意思決定の分野外においても理解可能なように Schwartz（2004 千葉・編集部訳 2004）を引用して“追求者”と翻訳した。“追求”とは広辞苑（新村，1998）によると“どこまでも後を追いかけ求めること”であり，大辞林（松村，1995）によると“目的とするものをねばり強く追い求めること”である。Schwartz et al.（2004）が定義する maximizer も意思決定において絶えず最高の選択肢を追い求める人を示すことから，“追求者”と翻訳しても意味から逸脱しないとみなした。

[4] 満足者（satisficer）は Simon（1955）の造語である。

研究 1

目 的

研究 1 では，Schwartz et al.（2002）によって作成された“後悔・追求者尺度”を翻訳し，日本人に回答を求めることによって“後悔・追求者尺度”の検討を行う。

方 法

調査参加者と手続き 調査参加者は学生計 307 名（男性 107 名，女性 198 名，不明 2 名。平均 23.93 歳，*SD* 7.43 歳，range 18―59 歳）であった。調査は 2004 年 10 月から 2005 年 6 月に，大学の講義時間の一部を用いて集団実施された。

質問項目 Schwartz et al.（2002）によって作成された“後悔・追求者尺度”を日本語に翻訳して使用した。翻訳された尺度は“後悔尺度”5 項目，“追求者尺度”13 項目の計 18 項目から構成される（Table 1）。各質問項目に対して，“全くそう思わない：1”から“非常にそう思う：7”の 7 件法で回答を求めた。

結果と考察

因子構造の検討 Schwartz et al.（2002）によって抽出された因子数をもとに，質問項目への回答に対して 4 因子解の因子分析（主成分解，バリマックス法）を行った。その結果，第 1 因子から“後悔”，“優柔不断”，“追求者”，“チャンネル探索”と解釈された。“後悔”は，“何かを選ぶ時はいつでも，もし違うものを選んだら，違う結果になったのではないか，と思ってしまう”など 4 項目から，“優柔不断”は“友達へのプレゼントを選ぶのによく苦労する”など 4 項目から，“追求者”は“今の仕事に満足していても，もっといい機会があるのではないかと思うのは当然だ”など 7 項目から，“チャンネル探索”は“テレビを見ている時，その番組を見続けるつもりでも，もっといい番組がないか，よくチャンネルを回してチェックする”，など 2 項目から構成された。1 項目（“一番の映画，一番の歌手，一番の俳優，一番の小説など，何でもランク付けするのが大好きだ”）は，いずれの因子にも高い負荷を示さなかった。

信頼性の検討 各因子の α 係数は，“後悔”が.84，“優柔不断”が.72，“追求者”が.61，“チャンネル探索”が.76 であった。従ってこれらの因子は概ね高い信頼性及び内的一貫性を持っていると判断された。

因子の検討 ただし本結果において抽出された 4 因子解は，Schwartz et al.（2002）が想定した 4 因子解と項目の構成が異なった。第一に，Schwartz et al.（2002）が後悔に関する因子（F1）とした項目（“何かを選ぶ時はいつでも，もし違うものを選んだら，どう

Table 1
Schwartz et al. (2002) における“後悔・追求者尺度”の因子分析結果(主成分解，バリマックス法)

因子1：後悔(α=.84)				
何かを選ぶ時はいつでも，もし違うものを選んだら，違う結果になったのではないか，と思ってしまう[a]	**.837**	.197	.223	.048
商品を選んでそれが良かったとしても，他の選択肢を選んだらもっと良い結果が得られていたかもしれない，という気持ちに襲われる[a]	**.759**	.228	.201	.198
人生のことを考える時，しばしば，過ぎてしまったチャンスにどれくらいの価値があったか考えてしまう[a]	**.752**	.096	.247	.197
一度決心したら振り返ることはない[a,e]	**−.725**	−.161	.257	−.131
因子2：優柔不断(α=.72)				
友達へのプレゼントを選ぶのによく苦労する[c]	.090	**.732**	.104	−.030
ビデオをレンタルする時はいつも，一番いいものを選ぼうと思ってとても苦労する[c]	.110	**.699**	.105	.230
買いものをしている時，本当に好きな服を選ぶとなると時間がかかる[c]	.113	**.691**	.182	.212
例え友達への手紙であっても，文章を書くのはとても苦労する。ぴったりと合う言葉を見つけるために，簡単な文でも何度も下書きをする[c]	.361	**.620**	.087	−.095
因子3：追求者(α=.61)				
今の仕事に満足していても，もっといい機会があるのではないかと思うのは当然だ[b]	.126	−.070	**.683**	.093
選択をする時はいつでも，例え今，目の前にない選択肢であろうとも，全ての可能性を考えてみる[d]	.267	.238	**.584**	.005
何かを選ぶ時はいつでも，もし違うものを選んだら，どういう結果になるかという情報を集めようとする[a]	.484	−.027	**.525**	−.080
自分のすることには何でも，最高の基準値がある[d]	.053	.311	**.446**	.085
自分にぴったりの結婚相手が見つかるまで，どのような恋人がいいか，服のように色々試してみたい[b]	−.091	.093	**.445**	.141
商品を選ぶ時，二番目に気に入ったもので満足したことはない[d]	.041	.248	**.410**	−.141
時々，今の生活とは全く違う生き方をしている自分を想像する[b]	.205	.037	**.406**	.065
因子4：チャンネル探索(α=.76)				
テレビを見ている時，その番組を見続けるつもりでも，もっといい番組がないか，よくチャンネルを回してチェックする[b]	.223	.070	.112	**.831**
カーラジオを聞いている時，その番組に満足していても，もっといい番組が流れていないか，他のチャンネルをよくチェックする[b]	.172	.096	.067	**.815**
いずれの因子にも高い負荷を示さなかった項目				
一番の映画，一番の歌手，一番の俳優，一番の小説など，何でもランク付けするのが大好きだ[b]	−.072	.154	.377	.304
因子負荷量の二乗和	2.99	2.28	2.25	1.72
寄与率(%)	16.6	12.7	12.5	9.50
累計寄与率(%)	16.6	29.3	41.8	51.4

[a]後悔に関する因子(F1)，[b]最良のものを探索することに関する因子(F2)，[c]購買行動に関する因子(F3)，[d]高い基準を設定することに関する因子(F4)(Schwartz et al., (2002))
[e]逆転項目

いう結果になるかという情報を集めようとする”）は，本研究では“追求者”になった。第二に，この“追求者”の中には Schwartz et al. (2002) が最良のものを探索することに関する因子(F2)とした三つの項目（“今の仕事に満足していても，もっといい機会があるのではないかと思うのは当然だ”など）及び，高い基準を設定することに関する因子(F4)とした三つの項目（“選択をする時はいつでも，例え今，目の前にない選択肢であろうとも，全ての可能性を考えてみる”など）が含まれていた。第三に，1 項目（“一番の映画，一番の歌手，一番の俳優，一番の小説など，何でもランク付けするのが大好きだ”）はいずれの因子にも高い負荷を示さなかった。

このように“後悔・追求者尺度”を日本で実施した結果，質問項目は Schwartz et al. (2002) が想定したように分離されなかった。従って“後悔・追求者尺

度”を日本で適用するには，因子構造が異なるために適切に測定することが困難になる可能性がある。

このような結果になった原因として第一に，本尺度の中にはカーラジオに対する態度を聞く項目があるが日本は車社会のアメリカと異なりカーラジオを頻繁に利用する人は限定されていると推定される。第二に，追求者及び満足者という概念は幅広い状況を仮定しているにも関わらず本尺度上では“カーラジオを聞いている時”など限定された状況下での意思決定を仮定していた。

以上の点を踏まえ研究 2 では，Schwartz et al. (2002) の“後悔・追求者尺度”をもとに日本人の生活様式に合致した質問項目を新たに作成する。また，質問項目をより抽象化して幅広い状況下での意思決定傾向を測定する尺度を作成する。

研 究 2

目 的

研究 2 では，日本人の生活様式に合致し幅広い状況下での意思決定を測定する質問項目を作成し検討を行う。

方 法

調査参加者と手続き 調査参加者は学生計 163 名（男性 58 名，女性 104 名，不明 1 名。平均 20.99 歳，*SD* 2.30 歳，range 19—47 歳）であった。調査は 2004 年 12 月に，大学の講義時間の一部を用いて集団実施された。

質問項目の作成 Schwartz et al. (2002) の質問項目における文言をもとにして，“追求者”と“後悔”の概念に対応する 36 項目を独自に作成した。質問項目は，一般的な日本人の生活様式に合致させること，幅広い状況下での意思決定を仮定することを重視した。各質問項目に対して，“全くそう思わない：1”から“確かにそう思う：5”の 5 件法で回答を求めた。

結果と考察

因子構造の検討 Schwartz et al. (2002) によって抽出された因子数をもとに質問項目への回答に対して 4 因子解の因子分析（主成分解，バリマックス法）を行った。その結果，第 1 因子及び第 2 因子は後悔に関する因子と解釈され，第 3 因子と第 4 因子は追求に関する因子と解釈された (Table 2)。

そこで次に，質問項目への回答に対して 2 因子解の因子分析（主成分解，バリマックス法）を行い，後悔と追求に関する因子に分離されるか検討した。その結果，4 因子解の因子分析において後悔と解釈された 15 項目のうち 13 項目は第 1 因子に，追求と解釈された 17 項目のうち 14 項目は第 2 因子に分離された。

各因子に含まれる質問項目を検討したところ，第 1 因子に負荷が高い項目は“過ぎてしまった事に対して，‘こうすれば良かった’などと考える事がよくある”など 14 項目，第 2 因子に負荷が高い項目は“新しい商品，流行の健康法など，つねに情報収集は欠かさない”など 14 項目であった。従って Schwartz et al. (2002) と同様に，第 1 因子は“後悔”，第 2 因子は“追求者”と解釈された。

次に理論的整合性及び因子負荷量の高さを考慮して各因子から 8 項目を選出した。これらの因子構造を検討するため再度因子分析（主成分解，バリマックス法）を行った結果，第 1 因子に負荷が高い項目は“何かを購入した後に，違うものにしていれば良かったという事がよくある”など 8 項目，第 2 因子に負荷が高い項目は“可能性がある限り，物事を追求する事に苦労は惜しまない”など 8 項目であった。これらの質問項目は前述の因子分析の結果と同様の因子に分類され，第 1 因子は“後悔”，第 2 因子は“追求者”と解釈された。作成された尺度は“日本版後悔・追求者尺度”と命名された。

信頼性の検討 各因子の α 係数は，“後悔”が.85，“追求者”が.74 であった。従ってこれらの因子は概ね高い信頼性及び内的一貫性を持っていると判断された (Table 3)。

因子の検討 因子間の関係性を検討するため“後悔尺度”と“追求者尺度”の尺度得点の相関係数を求めた。その結果，両尺度には弱い有意な正の相関が見られた（r=.20，p<.05)。従って追求者傾向が強いほど後悔傾向があった。これは Schwartz et al. (2002) の理論と一致する。

総 合 考 察

研究 1 では，Schwartz et al. (2002) によって作成された“後悔・追求者尺度”を翻訳して日本人に実施した結果，Schwartz et al. (2002) が想定したように項目が分離されなかった。そこで研究 2 では“後悔・追求者尺度”をもとに，日本人の生活様式に合致し幅広い状況下での意思決定を想定した新たな尺度を作成した。因子分析の結果，“後悔”，“追求者”の 2 因子が抽出された。両因子の信頼性は高く，また下位項目の尺度得点に弱い正の相関があった。従って日本人においても，追求者は後悔傾向が見られると解釈される。

今後の課題としては，本尺度と Schwartz et al. (2002) によって作成された尺度間の関連性を示す定量的根拠が望まれる。そのために，両尺度を同一調査参加者に反復して実施するなど，知見の獲得が必要とされる。

Table 2
著者らが作成した36項目，及び4因子解の因子分析結果(主成分解，バリマックス法)

因子1：後悔1				
何かを購入した後に，違うものにしていれば良かったという事がよくある[a]	**.831**	.126	.070	.014
選ぶのに苦労した商品でも，買った後に後悔する事が多い[a]	**.766**	.146	.132	−.079
購入した商品が良かったとしても，“もっと良いものもあっただろうに”と思ってしまうことが多い[a]	**.689**	.253	.180	−.040
ある商品を購入した際，より良い商品があった可能性を考えて後悔する事がある[a]	**.650**	.183	−.061	.089
過ぎてしまった事に対して，“こうすれば良かった”などと考える事がよくある[a]	**.602**	.404	.047	−.123
人生において，“あの時こうしておけば良かった”と強く思うことが多い[a]	**.601**	.208	.276	−.172
テレビやラジオのチャンネルを頻繁に回して，もっと楽しい番組を捜そうとする	**.417**	−.121	−.178	.151
因子2：後悔2				
くよくよ過去の事を悔やむ方だ[a]	.384	**.676**	−.022	−.060
持ち物，生活，境遇など，他人と比較してしまう[a]	.225	**.607**	.283	.025
自分は他人より心配性だと思う[a]	.300	**.555**	.111	.252
自分は優柔不断だと思う[a]	.289	**.497**	.164	.007
何かを選ぶ事に時間をかけすぎて，結局どうでもよくなってしまうことがある[a]	.185	**.481**	.010	.057
地震，病気，テロなどの話を聞くと，とても不安になる	−.025	**.462**	.091	.086
一度決心したら，二度と振り返らない[a]	−.170	**−.449**	.018	.417
何千分の一の確率でも，自分が最もおそれている出来事が起こる事に対して，不安を抱いている[a]	.319	**.422**	.240	.254
因子3：追求1				
どんな趣味でも，きわめてみたくなり，没頭するタイプである[b]	.015	−.086	**.732**	.187
お気に入りのもの，タレント，歌手などはとことん追求する[b]	−.064	.116	**.714**	.118
お気に入りのものは全て集めてみたくなる[b]	.117	.158	**.643**	.058
自分は情報通だと思う[b]	.092	.240	**.538**	.189
自分は他人より良い商品を選択する自信がある[b]	.041	−.159	**.513**	.415
新しい商品，流行の健康法など，つねに情報収集は欠かさない[b]	.094	.142	**.484**	.391
自分が購入したものより，他人が良いものを持っていたら，何だか悔しい[a]	.117	.375	**.470**	.005
現状に満足したことはない	.390	−.086	**.427**	.025
他人が良いものを持っている時は，どこでいくらで買ったのか知りたくてしょうがなくなる	.005	.381	**.404**	.008
因子4：追求2				
一つのものを買うにも，他店と比べてみることが多い[b]	−.024	.277	.089	**.659**
何かの決断をする時は，ありとあらゆる選択肢を考えてみる[b]	.280	−.013	.041	**.632**
商品を選ぶ時は，つねに最良のものを選ぶようにしている[b]	−.100	−.080	.267	**.543**
可能性がある限り，物事を追求する事に苦労は惜しまない[b]	.376	−.270	.235	**.512**
一つのものを買うにも，数種類のブランドを比べる事がよくある[b]	−.216	.413	.123	**.476**
一つのものを買うにも，数日間考え込む事がある[b]	.081	.329	.138	**.458**
買い物の時間や，商品を選ぶ時間が他人より長いと思う[b]	−.003	.350	.248	**.446**
購入する際は，外袋の表示をよく見てから決める[b]	.090	.206	.099	**.446**
いずれの因子にも高い負荷を示さなかった項目				
世間で良いと評判の商品でも，自分にとってあまり良くなかったら，絶対に買わない	−.043	−.128	.016	.376
今よりもっとすばらしい人生を送るために，日々努力している	.235	−.367	.167	.349
何かを決断する際，ある程度の妥協は仕方ないと思う	−.148	.392	−.293	−.217
計画を立てるのは大嫌いだ	.125	−.002	−.015	−.400
因子負荷量の二乗和	4.20	3.91	3.52	3.51
寄与率(%)	11.7	10.9	9.8	9.7
累計寄与率(%)	11.7	22.5	32.3	42.0

[a] 2因子解の因子分析における“後悔”因子
[b] 2因子解の因子分析における“追求者”因子