Schizotypy and handedness in Japanese participants, revisited
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Although previous studies have suggested a relationship between mixed-handedness and schizotypic symptoms, possibly indicating a predisposition to schizophrenia, the participants involved were exclusively from Western cultures. Only two reports have examined the relationship between handedness and schizotypy in Asian cultures, and both of these studies failed to show a significant association between mixed-handedness and schizotypy, possibly due to cultural pressures against left-handedness. In the present study we examined the relationship between handedness and schizotypy among Japanese participants (N = 231, study 1; N = 274, study 2). In order to avoid cultural biases, we used a modified handedness scale in addition to the traditional scale developed in Western cultures. As a result, we show for the first time that mixed-handed Japanese participants have the strongest schizotypal traits, particularly positive schizotypic traits (p < .05). These results suggest that positive schizotypal traits may be universally associated with mixed-handedness or atypical cerebral lateralisation, even in non-Western cultures.

Keywords: Schizotypy; Handedness; Laterality; Schizophrenia; Japanese.

Handedness has been a subject of interest in the field of schizophrenia research due to reports suggesting that atypical cerebral lateralisation may be a risk factor for the disease (Claridge & Broks, 1984; Gruzelier & Richardson, 1994). Moreover, patients with schizophrenia have been reported to show differences in lateralisation, as measured by handedness, when compared to controls (Reilly et al., 2001).

Such investigations have generally used two populations: patients with schizophrenia and normal participants with high schizotypy scores, which are...
thought to reflect a genetic predisposition to schizophrenia (Cyhlarova & Claridge, 2005; Lenzenweger, 2006). While studies of handedness in patients with schizophrenia have yielded a range of results, studies of schizotypy and handedness in normal participants have yielded more consistent data (Chapman & Chapman, 1987; Claridge, Clark, Davis, & Mason, 1998; Kim, Raine, Triphon, & Green, 1992; Poreh, 1994; Richardson, 1994; Shaw, Claridge, & Clark, 2001). The predominant finding to emerge from this research concerns the increased schizotypy scores among mixed-handed participants.

While the relationship between handedness and schizotypy is thought to be quite robust, Gregory, Claridge, Clark, and Taylor (2003) examined that relationship in Japanese participants to assess the strength of this link in a non-Western culture. Using several indices of current hand preference derived from the Annett (1970) Handedness Scale, these authors partly replicated previous findings. A significant association between schizotypy and non-right-handedness was found in males only after correcting for the effects of early switching of hand usage. The Japanese population shows a low frequency of left hand preference, generally assumed to be attributable to cultural pressures within Japanese society against left-handedness, at least for certain actions (e.g., writing or eating). If so, a hand preference questionnaire incorporating these Japanese cultural values is necessary to clearly define the relationship between schizotypy and mixed-handedness in Japanese people.

It would also be of interest to determine which components of schizotypy may be correlated with mixed-handedness. Gregory et al. (2003) measured schizotypy using the Oxford Schizotypal Personality Scale (STA; Claridge & Broks, 1984), which focuses on the healthy equivalents of positive symptoms of schizophrenia. In the current study we also assessed whether only “positive schizotypy” is correlated with mixed-handedness, or whether other symptom types (e.g., anxiety or depressive tendencies) are relevant.

**STUDY 1**

**Purpose of the study**

The purpose of Study 1 was to re-examine schizotypy and handedness, as measured by the Annett (1970) Handedness Scale, in Japanese participants. A previous study by Gregory et al. (2003) had not succeeded in showing a direct relationship between schizotypy and mixed-handedness. Thus we attempted to replicate that study in a different participant population to determine whether the same results would be attained.
Method

We rated 231 university students (aged 18–22 years, mean = 18.7; 170 men, 61 women) from an introductory psychology class with the STA (Oxford Schizotypal Personality Scale) and AHPQ (Annett Handedness Preference Questionnaire).

The STA (Claridge & Broks, 1984; Cyhlarova & Claridge, 2005; Gregory et al., 2003) is a 37-item self-report questionnaire based on the DSM-III diagnostic criteria for Schizotypal Personality Disorder (American Psychiatric Association, 1980). It measures schizotypal traits, especially perceptual aberrations that are analogous to positive symptoms, including auditory hallucinations.

In responding to the AHPQ, participants are required to indicate whether they use their right, left, or either hand for six primary and six non-primary common actions. The primary actions are writing, throwing, wielding a racquet, striking a match, hammering, and brushing teeth. The non-primary actions are using scissors, threading a needle, sweeping with a broom, using a shovel, dealing cards, and opening a jar. We classified the students into three handedness categories: right-, mixed-, and left-handed. First, following Annett’s (1985) revised classification system, we divided participants into seven groups. Using a decision tree, the authors first classified participants according to writing hand and then further classified them according to the pattern of preferences governing other actions. Group 1 consisted of fully right-handed individuals. Groups 2–4 comprised right-handed participants showing an increasing preference for using the left hand for activities other than writing. Participants assigned to Group 7 were fully left-handed, and those in Groups 6 and 5 were left-handed but showed an increasing preference for using the right hand for non-writing activities. In Annett’s scoring method, “either” responses are scored as preferences for the writing hand. In a second classification we distributed participants across three classes (“pure right”, “pure left”, and “mixed”). Pure right and pure left were identical to Annett’s groups 1 and 7, respectively. The mixed group included all other subjects (Gregory et al., 2003). Although previous studies have used several classification schemas (e.g., a simple dichotomy based on preferred writing hand in Gregory et al., 2003, and a sevenfold division in Annett & Moran, 2006), we employed the three-way classification system (i.e., right-, mixed-, and left-handed) in order to facilitate comparisons with the results of previous research.

Both questionnaires had been translated from English into Japanese with a standard process including back-translations in Gregory et al. (2003). We used the same.
Results and discussion

We averaged the STA scores of each handedness group (Table 1, left). One-way ANOVA revealed no significant effect of handedness group on STA scores, $F(2, 230) = 2.80, \text{ns}$. Next, similar to Gregory et al. (2003), we compared right- and non-right-handed groups (Table 1, right); however, a $t$-test showed no significant differences between right- and non-right-handedness on STA scores, $t(1, 230) = 1.53, \text{ns}$.

These results demonstrate the absence of a relationship between schizotypy, as measured by the STA scale, and handedness, as measured by the Annett (1970) Handedness Scale, in Japanese participants. These scales are the same as those used by Gregory et al. (2003), and replicated the findings described in that report in which no clear relationship was detected. Accordingly, in Study 2 we used a handedness scale designed for Japanese participants instead of the Annett (1970) Handedness Scale.

### STUDY 2

#### Purpose of the study

The purpose of Study 2 was to examine the relationship between schizotypy and handedness, as measured by the H.N. Handedness Scale (Hatta & Kawakami, 1995; Hatta & Nakatsuka, 1975), in Japanese participants. The unclear results described in Study 1 and in Gregory et al. (2003) could have been due to inherent bias in the Annett (1970) Handedness Scale, which was designed for Western cultures. We also sought to assess whether only “positive schizotypy” is correlated with mixed-handedness, or whether other symptom types (e.g., anxiety or depressive tendencies) are relevant.

#### Method

We rated 274 university students (aged 18–22 years, mean = 19.1; 173 men, 101 women) from an introductory psychology class with the STA, the H.N.
Handedness Scale, Trait Anxiety Inventory (STAI-T), Self-rating Depression Scale (SDS), and Oxford–Liverpool Inventory of Feelings and Experiences (O-LIFE). These scales were measured over three sessions; the STA, H.N. Handedness Scale (Hatta & Kawakami, 1995; Hatta & Nakatsuka, 1975), and STAI-T were given in the first session, the SDS during the second session, and the O-LIFE during the third session.

The H.N. Handedness Scale (Hatta & Kawakami, 1995; Hatta & Nakatsuka, 1975) is a revised version of the Edinburgh Inventory (Oldfield, 1971) for Japanese participants. Revisions were necessary because cultural differences render neither the Edinburgh Inventory nor Annett’s scale appropriate for Japanese participants. The scale is often used in Japan to measure or control handedness (e.g., Ogawa, Inui, & Sugio, 2006). In responding to this scale, participants are required to indicate whether they use their right, left, or either hand for 10 common actions: handling an eraser, striking a match, thumb tacking, hammering, brushing teeth, throwing, and using scissors, a knife, a screwdriver, and a shaver or lipstick. In this scale, ranging from 10 to 10, a “right” response is scored as 1, a “left” response is scored as 1, and an “either” is scored as 0. Compared to the Annett (1970) Handedness Scale, no “writing hand” component exists because most Japanese use the right hand to write, regardless of innate handedness. We classified the students into three handedness categories according to Hatta and Kawakami (1995): right- (≥ 8), mixed- (3–7), and left-handed (≤ 4).

The STAI-T (Spielberger, Gorsuch, & Lushene, 1970) is a well-known 20-item self-report questionnaire with responses based on a 4-point Likert metric system measuring anxiety traits. The SDS (Zung, 1965) is a well-known self-report 20-item questionnaire with responses based on a 4-point Likert metric system measuring depressive tendencies. The O-LIFE (Mason, Claridge, & Jackson, 1995) is a 104-item true/false self-report questionnaire measuring comprehensive schizotypal personality traits having four subscales: Unusual Experiences (UnEx), Introvertive Anhedonia (InAn), Cognitive Disorganisation (CoDi), and Impulsive Nonconformity (ImNo).

All questionnaires except for the H.N. Handedness Scale had been translated from English into Japanese before with a standard process including back-translations.

Results and discussion

We averaged the scores for each handedness group (Table 2). One-way ANOVA revealed a main effect of handedness on the STA scores, $F(2, 273) = 3.90$, $p < .05$, and UnEx scores in O-LIFE, $F(2, 96) = 4.73$, $p < .05$. A multiple comparison test using Tukey’s HSD method revealed that the
difference between the mixed- and right-handed group STA scores was significant ($p < .05$), as was the difference between mixed- and right-handed group scores on the UnEx ($p < .05$). These results suggest that mixed-handed students have the highest scores on schizotypal trait questionnaires. Given that the Unusual Experiences factor in O-LIFE measures positive symptom-like experiences, as does the STA, mixed-handedness can thus be correlated with positive schizotypy. Other traits (i.e., depressive or anxiety tendencies) appear to have no relationship with handedness.

### TABLE 2  
N.H. handedness and mental traits

<table>
<thead>
<tr>
<th>Handedness</th>
<th>STA ($N$)</th>
<th>STAI-T</th>
<th>SDS</th>
<th>Total</th>
<th>UnEx</th>
<th>CoDi</th>
<th>InAn</th>
<th>ImNo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>10.6 (215)</td>
<td>48.7 (207)</td>
<td>43.1 (100)</td>
<td>36.3 (80)</td>
<td>5.4</td>
<td>12.9</td>
<td>8.7</td>
<td>9.3</td>
</tr>
<tr>
<td>Mixed</td>
<td>13.7 (47)</td>
<td>48.3 (46)</td>
<td>43.4 (19)</td>
<td>43.7 (15)</td>
<td>10.0</td>
<td>15.5</td>
<td>7.7</td>
<td>10.5</td>
</tr>
<tr>
<td>Left</td>
<td>11.6 (12)</td>
<td>49.5 (12)</td>
<td>48.0 (4)</td>
<td>37.5 (2)</td>
<td>3.5</td>
<td>15.5</td>
<td>7.0</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Significance * ns ns ns * ns ns ns

STA = Oxford Schizotypal Personality Scale (Claridge & Broks, 1984); STAI-T = State–Trait Anxiety Inventory (Spielberger et al., 1970); SDS = Self-Rating Depression Scale (Zung, 1965); O-LIFE = Oxford–Liverpool Inventory of Feelings and Experiences (Mason, Claridge, & Jackson, 1995); UnEx = Unusual Experiences; InAn = Introvertive Anhedonia; CoDi = Cognitive Disorganisation; ImNo = Impulsive Nonconformity; ns = not significant. * $p < .05$.

### GENERAL DISCUSSION

The purpose of the present study was to examine the relationship between schizotypy and handedness in Japanese participants. We conducted two separate investigations; one was a replication of Gregory et al. (2003) using their original questionnaires, and the other was our study using modified questionnaires. Although the former study showed no clear relationship between schizotypy and handedness, the latter revealed that mixed-handed people have the highest positive schizotypal tendencies. These results suggest that participants’ cultures must be considered when assessing handedness and designing handedness scales. Comparing the two handedness scales, we found that the Annett (1970) Handedness Scale assigned more participants into mixed handedness than the H.N. Handedness Scale (Table 3). Interestingly, using the Annett (1970) Handedness Scale, Gregory et al. (2003) found that the percentage of mixed-handed Japanese participants was
higher than that in the United Kingdom participants, even though it is generally held that fewer Japanese are left- or mixed-handed. It may be because Annett’s scale emphasises the writing hand as the dominant hand. In Annett’s scale, even if someone writes with his/her right hand and uses his/her left hand for all other actions, he/she is not classified as being left-handed. Compared to the Annett’s scale, no “writing hand” component exists in the H.N. scale because most Japanese use the right hand to write, regardless of innate handedness. In Asian cultures, particularly the Japanese culture, left hand preference is relatively infrequent, presumably because of social pressures that militate against using this hand for certain activities, including writing (Shimizu & Endo, 1983; Singh & Bryden, 1994). In measuring handedness (as well as such other characteristics, such as personality), traditional standards regarding validity and reliability must be embedded within considerations of the fit between the testing instrument and the culture within which the study is conducted.

Several previous studies have suggested that mixed-handedness or ambidextrality is associated with schizotypal personalities. However, most of these studies were conducted in Western countries, such as New Zealand (Barnett & Corballis, 2002), the United Kingdom (Annett & Moran, 2006; Claridge et al., 1998; Shaw et al., 2001), the United States (Poreh, Whitman, Weber, & Ross, 1994; Raine, Sheard, Reynolds, & Lencz, 1992), France (Dollfus, Buijsrogge, Benali, Delamillieure, & Brazo, 2002), Germany (Sperling, Martus, & Barocka, 1999), and Greece (Stefanis et al., 2006). Only two published papers examined this relationship in non-Western cultures, specifically in Taiwanese (Chen & Su, 2006) and Japanese participants (Gregory et al., 2003). However, neither of these studies showed a relationship between mixed-handedness and schizotypy; rather, the only association was between non-right-handedness and schizotypy. Both of these studies used the Annett (1970) Handedness Scale, and it is possible that the scale was not suitable for Asian cultures, which tend to have less tolerant attitudes compared to Western societies towards left-handedness (Shimizu & Endo, 1983; Singh & Bryden, 1994). Accordingly, handedness scales that incorporate cultural values are essential.

<table>
<thead>
<tr>
<th>Handedness</th>
<th>Annett scale (study 1)</th>
<th>N.H. scale (study 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>47.6%</td>
<td>78.5%</td>
</tr>
<tr>
<td>Mixed</td>
<td>50.2%</td>
<td>17.2%</td>
</tr>
<tr>
<td>Left</td>
<td>2.2%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Total</td>
<td>231</td>
<td>274</td>
</tr>
</tbody>
</table>
In the present study we also extended the earlier work by Gregory et al. (2003) and Chen and Su (2006), which did not examine the relationship between handedness and other mental traits; for example, depressive and/or anxious tendencies. We failed to find an association of either of these traits with handedness. Thus, the traits with the strongest association with mixed-handedness are related to positive schizotypy, as opposed to comprehensive schizotypy, depression, or anxiety.

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REFERENCES


