Discussion

Results of present study show that the concordance between hand and eye preference and between hand and foot preference is similar to that reported in earlier studies (Mandal et al., 1993; Porac & Coren, 1981). Moreover, the inter-correlation among lateral preferences is also similar to that reported in earlier studies (Mandal et al., 1993). Thus, despite disproportionate representation of left-handedness in the sample the present study seems to involve no other bias. Because there is disproportionate number of left-handers it may not be appropriate to assess the profile of schizotypal personality in the population on the basis of this sample. However, if we consider only right-handers the profile of schizotypal personality is similar to that found in western societies (Gruzelier & Doig, 1996; Kim et al., 1992; Satz & Green, 1999).

Handedness, footedness, and eyedness are different indices of cerebral lateralization (Mandal et al., 1993; Porac & Coren, 1981). Cerebral lateralization has been suggested to have a determining role in schizophrenia (Crow, 2004; Dragovic & Hammond, 2009; Gruzelier & Doig, 1996; Satz & Green, 1999; Schiffman et al., 2005; Sommer et al., 2001). Results show that handedness and
Lateral preferences and schizotypal footedness are significantly related with schizotypal personality scores. This lends some support to the relationship between cerebral lateralization and schizotypal personality. Analysis of the pattern of correlations between lateral preferences and schizotypal personality scores shows that footedness has strongest relationship with schizotypal personality and its factors. Some earlier studies have also reported such a pattern of relationship between lateral preferences and schizotypal personality (Schiffman et al., 2005).

Several studies have shown that non-right handedness is related with schizophrenia (Crow, 2004; Dragovic & Hammond, 2009; Schiffman et al., 2005; Sommer et al., 2001). Non-right handedness includes both left handedness and mixed handedness categories. The literature on relationship between handedness and schizotypal personality also shows that mixed handedness is the category which shows clear association with schizotypal personality (Annett & Moran, 2008; Kim et al., 1992; Somers et al., 2008). In consonance with the classification used in these earlier studies the lassos fit scatter plotting in present study supports the classification of handedness into left-handed, mixed-handed, and right-handed categories as far as schizotypal personality is concerned.
The results of present study show that when the different indices of cerebral lateralization were regressed on schizotypal scores, the tripartite handedness classification (handedness 3C) renders every other indices of lateral preference (LQ foot, LQ eyes and LQ hand) redundant. The regression analysis further shows that hand-eye preference and sex also show a relationship with schizotypal personality scores. Based on the regression analysis we choose handedness (3C), sex, and hand-eye preference as independent variables for further analysis.

Analysis of variance shows that non-right-handers (left- and mixed- handed) have higher schizotypal scores than right-handers. Several prior studies have reported a similar relationship between schizotypal personality and mixed-handers in western societies (Collinson et al., 2004; Gruzelier & Doig, 1996; Schiffman et al., 2005; Somers et al., 2008). Few studies conducted in Asian societies also reported relationship between non-right handedness and schizotypal personality similar to present study (Asai & Tanno, 2009). The present study is the first report of relationship between handedness and schizotypal personality scores in India. It may be said that relationship between schizotypal personality and non-right handedness is similar in different societies of the world.
The results of present study also show that sex interacts with handedness in effecting the schizotypal personality. Men have higher schizotypal score than women in the categories of mixed- and right- handers, whereas among left-handers women have higher schizotypal scores than men. We found no prior study reporting interaction between handedness and sex.

Theories of lateralization suggest that different lateral preferences reflect the same underline lateralization process (Annett, 1999; McManus et al., 1999), and thus, for example, right preference of hand, foot and eye may be determined by same mechanism. Based on this some studies have clubbed left or right preference in different lateral preference indices and have shown that concordant left lateral preference is related with relatively higher schizotypal scores (Dragovic et al., 2004). Results of present study, however, show no difference in schizotypal personality scores of concordant left, concordant right, and mixed hand-foot-eye preference.

Consistent with the theories of lateralization, left foot preference when discordant with hand preference do shows relatively higher schizotypal score than concordant right hand-foot preference. However, among left-handers concordant hand-foot
Lateral preferences and schizotypal personality shows schizotypal score similar to discordant hand-foot preference group. Moreover, the results of present study show that discordant hand-eye preference shows relatively higher schizotypal personality scores than concordant among right-handers, opposite to the theory.

Traditionally, discordance from right preference has been associated with disorders and low cognitive performance (Porac & Coren, 1976; Wile, 1942). However, more recent studies have failed to find such a relationship (Fagard et al., 2008; Teng et al., 1979). In the present study also we found that the concordant hand-eye preference is related with relatively higher schizotypal scores than discordant hand-eye preference. Moreover, the results of present study clearly show that the effects of concordant or discordant lateral preferences (on schizotypal personality) are not tied to the direction of preference.

In the present study we also attempted understanding the relationship of handedness, sex, and hand-eye preference with the different factors of schizotypal personality. Results of present study show that right-handers are different from non-right-handers on all the three factors of schizotypal personality: cognitive-perceptual, interpersonal, and odd-behavior. Several studies have reported that
handedness difference is limited to the positive dimensions of schizotypal personality (cognitive-perceptual; Asai & Tanno, 2009; Kim et al., 1992). However the present study reports a pervasive effect of handedness on schizotypal personality.

Literature reports that whereas schizophrenia is related with left handedness along with mixed handedness (Dragovic & Hammond, 2009; Sommer et al., 2001), schizotypal personality is reported to be related with mixed handedness only (Somers et al., 2008). However, no theoretical explanation has been proposed to explain this difference between schizophrenia and schizotypal personality in the pattern of expression of relationship with handedness. In the present study we wish to report that both left-handers and mixed-handers differ from right-handers in schizotypal personality, and thus, similar to schizophrenia, rather than mixed handedness it is the non-right handedness that may be the relevant classification in understanding schizotypal personality.

Theoretically, emphasis on exclusive involvement of mixed handedness in schizotypal personality strongly points towards pathological determinants (Satz & Green, 1999), whereas the involvement of both left- and mixed- handedness supports the genetic factors (Dragovic & Hammond, 2009).
Results of present study show that male participants score higher than female participants on the cognitive-perceptual and the odd-behavior dimensions of schizotypal personality. Earlier studies have also reported elevated rates of ‘positive’ schizotypal personality traits of eccentric/odd behavior among male subjects (Ma et al., 2007; Roth and Baribeau, 1997). Although there are studies reporting higher positive schizotypal scores among women than men (Badrock & Dragovic, 2006; Raine, 1992) meta analysis and large studies suggest that there may be no difference between males and females in positive symptoms (Guo et al., 2011; Miettunen & Jaaskelainen, 2010). One study involving confirmatory factor analysis has shown that the dimension of disorganized-behavior is important for a better fit to schizotypal personality and similar to positive schizotypal personality and dissimilar to negative schizotypal personality shows relationship with increased emotionality (Kerns, 2006).

In present study, no sex difference is reported for interpersonal dimension of schizotypal personality. Studies in western (Badrock & Dragovic, 2006; Miethunen & Jaaskelainen, 2010; Raine, 1992) as well as non-western societies (Guo et al., 2011) have reported higher score among men than women in
negative (interpersonal) dimension of schizotypal personality. It is probably due to the reversal of sex difference (higher scores for female than male) in ‘social anxiety’ subscale from other subscales of interpersonal dimension (trend of higher scores for male than female) that no overall sex difference appeared (See Figure 19).

The present study reports no sex difference in overall schizotypal personality scores which is similar to almost all earlier studies (Badrock & Dragovic, 2006; Guo et al., 2011; Miethunen & Jaaskelainen, 2010; Raine, 1992).

An interesting phenomenon is apparent in the pattern of expression of handedness difference in the schizotypal personality sub-scales among male and female. Among female left-handers have larger scores on all subscales of schizotypal personality than right-handers. Further, left handers have also higher scores on some subscales of schizotypal personality than mixed-handers. Whereas among male mixed-handers have larger scores on schizotypal personality subscales than the right-handers and left-handers (See Figure 19). This point towards pervasive expression of interactional relationship between handedness and sex in their effects on schizotypal personality (reported for schizotypal personality and factors also). Thus, it may be said that expression of the
relationship between handedness and schizotypal personality is mediated by sex. Theories have proposed that cerebral lateralization and schizophrenia is determined by a gene located on X chromosome (Crow, 1992) and thus anomalous dominance, represented by non right handedness, and schizophrenia are linked but have a differential pattern of expression among male and female. Thus, the interaction between handedness and sex points towards a genetic determination of this relationship between handedness and schizotypal personality.

Hormonal effects may provide an alternative explanation of the interaction between handedness and sex on schizotypal personality. Studies have shown that prenatal androgen level affects cerebral lateralization (Geschwind & Galaburda, 1985). Moreover, several studies have linked high prenatal androgen levels with schizotypal personality (Arato et al., 2004; Walder et al., 2006). Geschwind and Galaburda (1985) have proposed that high prenatal androgen level constricts the development of left hemisphere and thus leads to anomalous dominance of lateralized function, which in turn leads to developmental disorders like schizophrenia. Because prospective studies have shown that cerebral lateralization precedes the occurrence of schizophrenia or schizotypal personality
(Schiffman et al., 2005; Collinson et al., 2004) it appears that whatever determinant is involved, hormones or genes, it effects the cerebral organization first, which in turn determines the schizophrenia or schizotypal personality.

Results of present study show that among the different dimension of schizotypal personality only the interpersonal dimension expresses a difference between concordant and discordant hand-eye groups. At the levels of subscales also, pattern of relatively higher scores among participants with concordant hand-eye preference than discordant preferences appears for subscales of interpersonal and odd-behavior dimensions. It thus appears that concordance in hand-eye preference is linked with negative dimensions of schizotypal personality, which is reportedly determined by genetic factors (Crow, 1992).

Although it has been presumed that same lateralization mechanism is involved in different modalities (here hand and eye) and the discordance appears due to random expressional differences in the lateralization of modalities (McManus et al., 1999), the reported consistent differences between concordant and discordant hand-eye preference irrespective of the side of preference and its relationship with interpersonal dimension of schizotypal personality
suggests that discordance in hand-eye preference is genetically determined and is related with decline in schizotypal personality.

The results of present study show that the relationship between hand-eye preference and the interpersonal factor of schizotypal personality expresses more strongly among male than female. It is difficult to explain this differential expression of sex difference in effect of concordant-discordant hand-eye preference on interpersonal dimension of schizotypal personality.

The present study shows that general pattern of relationship of lateral preferences and sex with schizotypal personality is similar to the earlier studies conducted in different societies. However, present study also reports subtle differences from earlier studies in relationship of lateral preferences and sex with schizotypal personality. It has been suggested that ‘genetic susceptibility factors’ vary between societies especially in the expression of sex differences (Gau et al., 2011), and thus, some of the lateral preference and sex differences in schizotypal personality, reported in present study, may be unique to Indian population. More large scale studies are required to be conducted in Indian population to ascertain such a possibility.