# Exploratory Factor Analysis of Perceived Causes of Autism Scale

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The objectives of the current study were to unfold the parental beliefs about autism and the development of an indigenous tool measuring these etiological beliefs.The nature of the study was descriptive with a survey that was carried out in six districts of Punjab, Pakistan. On the basis of indepth interviews from four parents and related literature, an indignous tool, Perceived Causes of Autism Scale (PCAS) was initially developed and was administered to 133 parents selected through a purposive sampling technique. The results revealed that parents held six different types of beliefs about the causes of autism that included genetic, medical, environmental and neurological, prenatal and postnatal, and causes rooted in parent and child psychological problems. The analysis highlighted that parents rated prenatal and postnatal factors were the highest among all others. Future studies are needed to investigate the formation of the parents' beliefs by outlining the major factors involved.
*Keywords:* etiology of autism, parents of autistic children, prevalent belief, Perceived Causes of Autism Scale (PCAS)

Autism Spectrum Disorder (ASD) is a group of neurodevelopmental disorders that affects communication skills, socialization and the imagination abilities of children and usually initiates around two years of age (Farrell, 2009). The difficulty in interacting with others is the most common problem with autistic children (Bowe, 2007), which makes it the third most common disorder in children after mental retardation and cerebral palsy (Delobel-Ayoub et al., 2017). In United States, 1 out of 110 children suffered from autism in 2009 (CDC, 2009) which increased to 1 in 88 children in 2012 (CDC, 2012). In India, 1 out of 250 children were diagnosed with autism (Rahman, 2004). In Pakistan, the prevalence rates for autism are 1 in 49 children, and in Lahore, 53 children were identified with this disorder (Fazil, 2010).

The treatment of autism is debated and differences in opininons about the interventions prevail; that is why clinicians, parents, and teachers have their own lenses through which they interpret the symptoms of autism and choose different interventions to manage the condition (Chedd & Levine, 2013). However, early interventions with effective planning can have magical effects on lowering autistic symptoms (Farrell, 2009) and include biological, psychodynamic and educational dimensions (Roberts & Prior, 2010).

There are multiple causes of autism including genetic, prenatal, postnatal, environmental, and brain-related aspects (Grafodatskaya, Chung, Szatmari, & Weksberg, 2010). In Pakistan, healthcare professionals report a portion of postnatal negligence of parents can cause autism. But parents have their own unique style of perceiving about the causes of autism (Imran, Chaudry, & Azeem, 2011) for example, misperceptions that autism can be caused by MMR, vaccinations etc., even though the literature disavows such parenetal perceptions (Jain et al., 2015).

Parental beliefs about the cause of autism thus determines the role they play for their children and their choice of intervention (Levy & Hyman, 2003). To manage a child with autism is a very hectic job for parents. They have to spend long hours in implementing therapeutic regementations and planning educational activities for their children. While making these efforts, they are continually concerned about the future of their child (White et al., 2012). The beliefs of parents about the cause of autism are worth understanding because they can guide their choice of interventions (Dardennes et al., 2011; Levy, et al., 2003).

Parents filter information on the basis of their own experiences and beliefs and perceive multiple causes behind autism (Avdi, Griffin, & Brough, 2000). Their beliefs also influence health-related behaviors, for example, vaccinations for the child, and family planning future births (Bazzano, Zeldin, Schuster, Barret & Lehrer 2012; Rosenberg et al., 2013).

Previous literature is largely western in context, so we needed to investigate this phenomena in Pakistan. The uniqueness of the current study is that the researcher has developed an indigenous tool to investigate these beliefs in parents, about autism in Pakistan.

## Method

### Sample

The researcher selected a sample of 133 (Fathers = 41, Mothers = 92) parents of children with autism from government and private sector schools in six districts of Lahore (see Table 1). As parents'level of education also influcne their perception, the researcher also collected data regarding their education. Maximum variation purposive sampling technique was used to draw a diverse sample and only those parents were included in the sample whose children were clinically diagnosed with autism (DSM-V, 2013). The researchers collected data from 12 schools, 10 centres for autism in six districts of Punjab; and in 17 cases, the data were collected by making home visits with the written permission of school and parents. The researcher also used snowball sampling technique because the access to diagnosed children in Punjab was challenging. The parents who were accessed from school helped the researchers to find some more parents of diagnosed autistic children.

Table 1
*Demographic Characteristics of Participants (N = 133)*

| Variable | M | SD |
|---|---|---|
| Age of father | 42.51 | 7.61 |
| Age of mother | 37.13 | 6.61 |
| Age of child | 11.73 | 5.56 |
| Father's education (years) | 13.55 | 4.13 |
| Mother's education (years) | 13.03 | 4.84 |

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## Instrument

**Perceived Causes of Autism Scale (PCAS).** On the basis of in-depth interviews with four parents and related literature, the tool PCAS was initially developed by the authors. The researchers also followed the process of validation of the tool by five experts from the fields of psychology, clinical psychology, and special education. The measure consisted of an initial pool of 48 items to be rated on a 5-point Likert-type scale that ranged from strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1).

## Procedure

Written permission was taken from all the parents and the data were collected on a one-to-one basis. After the data collection, the analysis was run by using SPSS, Version 20 (IBM Corp. Released 2011).

## Results

Exploratory Factor Analysis (EFA) was performed on PCAS and to check psychometric properties of the scale, Principal Component Factor (PCA) analysis with Varimax Rotation.

To assess the suitability of the data for factor analysis KMO and Bartlett's test was run to check the sample adequacy (Kaiser, 1960). According to this test, the value for minimum adequacy is 0.5 (mediocre = 0.5-0.7, good = 0.7-0.8, great = 0.8-0.9, and superb if above 0.9). KMO measure was .91 which falls into the category of "superb". Bartlett's test of sphericity was observed highly significant, $x^2$ (1128) = 5429.00, $p < .001$, which indicated that the inter-item correlation is sufficiently large for PCAS.

Six factors were determined, although three and four factors solutions were also analyzed, however six factor analysis was most suitable, so researchers retained this six factor analysis. Items for scale was selected on the basis of having more than .50 or greater factor loading, and five items were excluded due to less than .50 factor loading. According to Anna and Jason (2005) the items that have loading .50 or better are called the most desirable and indicate a solid factor.

The factors were critically analyzed on the basis of relevance of each item with the factor. The first factor loaded on nine items. Likewise, 9, 6, 9, 5, and 4 items were loaded on second, third, fourth, fifth and sixth factors respectively. Table 2 shows the factor loading of each item in its relevant theme.

Table 2
*Factor Structure, Item Analysis, Eigenvalue, % of Variance, Cumulative % of Variance and Reliability Estimates of PCAS (N = 133)*

| No | Statement | F1 | F2 | F3 | F4 | F5 | F6 | Eigen Values | % Variance | % Total Variance |
|---|---|---|---|---|---|---|---|---|---|---|
| 41 | Mood disturbances of parents | **.81** | .20 | .21 | .22 | .23 | .04 | 7.422 | 15.46 | 15.46 |
| 40 | Personality of parents | **.76** | .22 | .20 | .21 | .18 | .00 | | | |
| 37 | Compulsive behavior of parents | **.76** | .23 | .28 | .13 | .23 | .02 | | | |
| 38 | Poor parenting skills | **.71** | .28 | .26 | .07 | .19 | .12 | | | |
| 39 | Parents' psychological problems | **.71** | .31 | .14 | .21 | .16 | .08 | | | |
| 32 | Stress of parents | **.70** | .12 | .33 | .13 | .10 | -.02 | | | |
| 36 | Emotional disturbances of parents | **.69** | .14 | .46 | .11 | .20 | .04 | | | |
| 34 | Parents' behavior | **.59** | .13 | .42 | -.09 | .35 | .08 | | | |
| 35 | Negative thinking of parents | **.59** | .22 | .29 | .22 | .39 | .06 | | | |
| 10 | Influenza during pregnancy | .09 | **.79** | .15 | .14 | .12 | .07 | 7.285 | 15.17 | 30.63 |
| 6 | Ultrasound during pregnancy | .18 | **.75** | .17 | .08 | .18 | .07 | | | |
| 7 | Deficiency of folic acid in mother | .15 | **.69** | .14 | .27 | .04 | .08 | | | |
| 8 | Maternal malnutrition during pregnancy | .35 | **.69** | .11 | .15 | .11 | .15 | | | |
| 9 | Exposure to heavy metals during pregnancy | .05 | **.67** | .09 | .27 | .23 | .26 | | | |
| 12 | Antibiotic during pregnancy | .36 | **.64** | .23 | .19 | .16 | .06 | | | |
| 5 | Maternal infection during pregnancy | .11 | **.63** | .23 | .09 | .04 | .20 | | | |
| 3 | Siblings with same disorder | .09 | .06 | .05 | .27 | .15 | **.53** | | | |
| 14 | Vaccination | .08 | **.58** | .10 | .17 | .12 | .12 | | | |
| 13 | Viral infection to child after birth | .32 | **.54** | .12 | .17 | .37 | -.00 | | | |
| 11 | Persistent Fever during pregnancy | .37 | .14 | .06 | .32 | .23 | .29 | | | |
| 29 | Mood disturbance of child | .20 | .22 | **.85** | .10 | .12 | -.05 | 5.262 | 10.96 | 41.60 |
| 28 | Behavioral problems of child | .23 | .14 | **.83** | .09 | .05 | .02 | | | |
| 30 | Compulsive behavior of child | .21 | .15 | **.73** | .12 | .33 | .12 | | | |
| 31 | Anxiousness of child | .27 | .18 | **.72** | .03 | .18 | -.05 | | | |
| 26 | Emotional disturbance of child | .43 | .05 | **.57** | .30 | .02 | .09 | | | |
| 27 | Personality of child | .36 | .08 | **.53** | .18 | .03 | .15 | | | |
| 20 | Smoking | .32 | .35 | .07 | **.67** | .07 | .30 | 5.064 | 10.55 | 52.15 |
| 18 | Advanced parental age | .23 | .24 | .12 | **.65** | .04 | .40 | | | |
| 19 | Pollution in the environment | .23 | .39 | .10 | **.64** | .09 | .10 | | | |
| 24 | Head injury to child | .26 | .43 | .09 | **.61** | .15 | .03 | | | |
| 17 | Exposure of child to heavy metals | .06 | .41 | -.01 | **.61** | .19 | .29 | | | |

| No | Item | | | | | | | | | |
|----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 21 | Videos child watched | .31 | .14 | .23 | **.59** | .10 | .24 | | | |
| 22 | Brain abnormalities | -.05 | .04 | .31 | **.56** | .36 | .07 | | | |
| 23 | Chemical imbalance | .02 | .26 | .34 | **.55** | .34 | -.04 | | | |
| 15 | Accident of child | .30 | .48 | .05 | **.54** | .06 | .03 | | | |
| 46 | Food allergies of child | .20 | .18 | .28 | .28 | **.68** | .02 | 3.815 | 7.95 | 60.10 |
| 42 | Fever-suppressing medication | .22 | .29 | .10 | -.02 | **.64** | -.08 | | | |
| 45 | Poor medical care of child | .39 | .16 | .06 | .22 | **.56** | .23 | | | |
| 48 | Psychiatric medication to child | .40 | .00 | .19 | .30 | **.55** | .22 | | | |
| 43 | Immune deficiency of child | .39 | .31 | .25 | .16 | **.55** | .02 | | | |
| 4 | Relatives with same disorder | .02 | .20 | .15 | .17 | .11 | **.76** | 2.794 | 5.821 | 65.92 |
| 1 | Inherited from parents | .03 | .21 | .00 | .19 | -.09 | **.75** | | | |
| 2 | Identical twins | .16 | .46 | -.04 | .28 | .17 | **.54** | | | |
| 25 | Stress of child | .45 | .01 | .45 | .42 | .12 | .19 | | | |
| 33 | Bad luck of parents | .24 | .22 | .41 | .03 | .10 | .20 | | | |
| 16 | Malnutrition of child | .35 | .38 | .05 | .42 | -.05 | .14 | | | |
| 47 | Digestive problems of child | .32 | .25 | .37 | .25 | .49 | -.05 | | | |
| 44 | Poor neonatal health | .41 | .30 | .04 | .00 | .47 | .24 | | | |

*Note:* factor loading >.50 have been boldfaced

**Factor 1: Parents' Psychological Problems**

Factor 1 contained nine items indicating different psychological aspects related to parents depicted by items 32, 34, 35, 36, 37, 38, 39, 40, and 41. These items were about "mood disturbances", "personality", compulsive behavior", "poor parenting", "stress and worry", "emotional disturbances", and "negative thinking of parents". These items denoted parents' perception of their psychological issues and how they would affect the mental health of their children.

**Factor 2: Pre and Postnatal Causes**

Factor 2 contained a total nine items related to perceived prenatal and postnatal causes of autism and included items, 5, 6, 7, 8, 9, 10, and 12, for prenatal causes, and items 13 and 14 for postnatal causes of autism. The examples of prenatal include "poor nutrition of mother", "deficiency of folic acid", "exposure to heavy metals", "use of antibiotics", and "infections". Whereas the items related to postnatal period include "vaccination" and "viral infection with child". Overall, the items in this factor denoted the perceived causes of autism related to pre-birth and postnatal period.

**Factor 3: Child's Psychological Problems**

Factor 3 comprised of six items related to perceieved psychological problems of the child. The items are about the "mood disturbances", "behavioral problems", "compulsive behavior", "anxiousness", and "emotional disturbances", and included items 26, 27, 28, 29, 30, and 31. These items represent parents' concerns over the child's psychological characteristics as one of the risk factors for developing autism.

**Factor 4: Environmental and Neurological Causes**

Factor 4 included a total of nine items related to environmental and neurological causes of autism. Items 15, 17, 18, 19, 20, 21, and 24 included environmental causes like "pollution", "smoking", accident, "videos the child watched", and "advance parental age". And items 22 and 23 neurological causes like, "brain abnormalities" and "chemical imbalance". Items in this factor indicated that parents of autistic children do not only relate autism to birth, but also environmental and neurological causes.

**Factor 5: Medical Causes**

This factor 5 comprised of five items related to medical causes of autism that parents perceived. Item 42, 43, 45, 46, and 48 were included and refered to, "food allergies of the child", "fever-suppressing medication", "poor medical care", and "immune deficiency in the child". Overall the items in this factor represent the medical basis of autism which parents perceived.

**Factors 6: Genetic Causes**

The last factor comprised of items 1, 2, 3, 4 depicting genetic basis of autism. The examples include "relatives with the same disorder", "inherited by parents", "siblings with the same disorder" and "identical twins". These items denote the perception of parents about the perceived genetic causes of autism.

The reliability analysis (Table 3) showed that PCAS has high internal consistency. Out of 48 items in PCAS 6 items (11, 16, 25, 33, 44, and 47) did not load on any of the above factors. Remaining 42 items showed homogeneity, as revealed by the value of Cronbach (α = .96) of total 42 items.

Table 3
*Cronbach Alphas of Total Items in each Factor*

| No | Factor | Items | *M (SD)* | Median | α |
|----|--------|-------|----------|--------|---|
| 1 | Psychological (Parents) | 9 | 24.15 (8.49) | 25.00 | .95 |
| 2 | Pre and postnatal Causes | 9 | 25.64 (9.10) | 25.00 | .92 |
| 3 | Psychological (Child) | 6 | 17.79 (5.41) | 18.00 | .90 |
| 4 | Environmental & Neurological Causes | 9 | 22.38 (7.61) | 23.00 | .91 |
| 5 | Medical Causes | 5 | 13.81 (4.40) | 14.00 | .84 |
| 6 | Genetic Causes | 4 | 9.67 (3.86) | 9.00 | .83 |
| | Total | 42 | 113.44 (31.562) | 109.00 | .96 |

Table 3 shows high internal consistency of all factors, alpha values range (.83-.95).

Table 4
*Intercorrelation between Subscales and Total Scores of PCAS (N=133)*

| Factors | 1 | 2 | 3 | 4 | 5 | 6 | Total |
|---|---|---|---|---|---|---|---|
| 1  Psychological (Parents) | | .60** | .68** | .59** | .70** | .34** | .84** |
| 2  Pre and Postnatal | | | .48** | .71** | .60** | .63** | .87** |
| 3  Psychological (Child) | | | | .49** | .57** | .26** | .72** |
| 4  Environmental and Neurological | | | | | .61** | .63** | .85** |
| 5  Medical | | | | | | .38** | .79** |
| 6  Genetic | | | | | | | .65** |

**p < .01

Table 4 shows intercorrelations between factors (subscales) of PCAS, the analysis reveals positive significant correlations among all.

To further unfold the etiological beliefs of parents about autism researchers carried out differences in fathers and mothers on PCAS. We had predicted that mothers would have higher perceptions for psychological and pre-and postnatal causes for autism, and fathers higher on environemtal, neurological, medical and genetic causes. However, we found no significant ($p > .05$) differences in how mothers and fathers perceieved causes for autism in their children (see Figure 1). And both parents perceived psychological problems (child), prenatal and postnatal causes, and environmental and neurobiological causes higher than psychological problems (parents), medical and genetic causes.
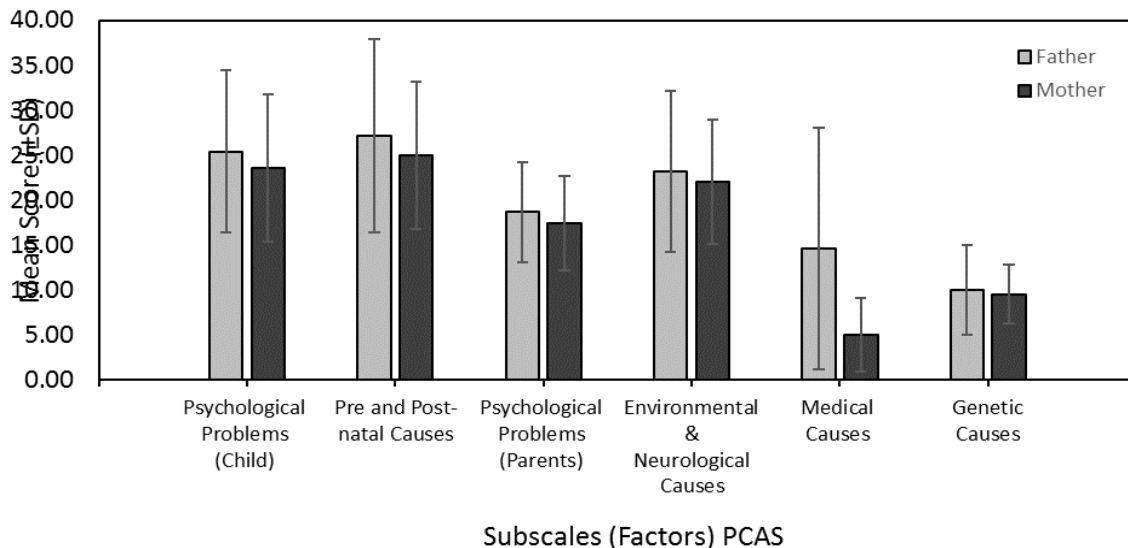


*Figure 1*. Parents perception and beliefs about causes of autism. Fathers and mothers did not significantly differ in their perceptions across these causes.

## Discussion

The present study was conducted to unfold the parental beliefs about autism and the development of an indigenous tool measuring these etiological beliefs of a sample of parents from the province of Punjab, Pakistan. This resulted in developing a tool, PCAS with the help of related literature and information gained from parents' interviews about their children's autism.

An EFA resulted in six factors namely, psychological problems (child), prenatal and postnatal causes, psychological problems (parents), environmental and neurological causes, medical causes, and genetic causes. Dardennes et al. (2011) investigated parental beliefs about the cause and treatment choices for autistic children and used Lay-Beliefs about Autism Questionnaire. Factor analysis for this questionnaire resulted in five-factor solution. The factors that emerged were psychogenic and external factors, the impact of luck, environmental and pregnancy factors, drugs and genes, diet, abnormality of brain. The data were collected from 78 parents who reported that autism was related to brain abnormalities and genetic factors (Furnham & Buck, 2003, see also Mercer et al., 2006). The factors reported in this French study were similar to our study, however, the strength of perceptions were not comparable with the present study, parents reported lower perceptions about genetic factor leading to autism which suggests a cultural difference between French and Pakistani parents. We can only speculate and suggest that parents in France are more scientifically aligned because of their educational level and know more about heredity conditions that lead to autism in their children as opposed to Pakistani parents whose knowledge may not be so science driven as demographics of Pakistani parents suggest only high school level exposure to science in this study.

Harmful infections during prenatal period, may pass from mother to the fetus via the placenta. It is also possible that the mother's immune system may become compromised to the developing brain of the fetus (Ornoy, Fudim, & Ergaz, 2016). Similarly Collier, Rasmussen, Feldkamp, and Honein (2009) found 64% mothers reported that the cause of autism was infections of the mother during pregnancy, which is not different to our results that report

high perception or belief in mothers and fathers related to pre and post natal factors although there is no sound scientific bearing of such factors for autism (Zerbo et al., 2016).

For environmental factors, a number of studies claimed that if families lived in or near an agricultural area during pregnancy, the risk of autism increased (Ornoy, et al., 2016; Mandy & Lai, 2016). As far as neurological causes were concerned, various studies of prenatal ultrasound measurement found that the differences in the development pattern of the brain in fetuses are certainly later diagnosed with autism. Children who are later diagnosed with autism have reported having a large size of the head (Unwin et al., 2016).

Parents also believed that child's medical problems lead to autism. This perceived cause of autism has not been researched much. The available literature showed that food allergies were more common in children with ASD than those without autism (Gurney, McPheeters, & Davis, 2006).

Previous literature claims that the families belonging to non-white background do not attribute the chronic illness, developmental delay and behavioral issues of children with health-related issues. Likewise, they are less likely to choose medical treatments but in the present study, the findings are vice versa (Akins et al., 2014; Levy, Mandell, Merhar, Ittenbach, & Pinto-Martin, 2003; Yeh, Hough, McCabe, Lau, & Garland, 2004).

The present study has revealed a number of etiological beliefs and perceptions Pakistani parents have for autism. The major contribution of this study is the development of an indigenous tool about autism and measure etiolgical beliefs of parents with autistic children. Future studies will highlight the influence of these belief on selecting interventions for autistic children.

## Limitations, Suggestions and Implications

Due to the limited resources and time, the researchers could collect data from only six districts of Punjab, Pakistan, thus the sample size to carry out factor analysis was small. Nevertheless, the analysis of the scale revealed that parents of children with autism had multiple beliefs and perceptions about the cause of autism. Future researchers should consider more in-depth analysis about parents' perception and beliefs about autism by conducting on a wide scale study covering all the districts of Punjab so that data could be compared to studies carried out in western countries.

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