A Study of Association between Cognitive Attributions, Appraisals and Depression in Children with High Functioning Autism Spectrum Disorders

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Abstract: Children with high-functioning autism spectrum disorders (HFASD) have been shown to exhibit co-morbid symptoms of clinical depression and also exhibit a negative attribution style. Research evidence from studies carried out with children without autism has shown a significant association between negative attributions and depression, there is however limited research evidence in the case of children with autism. The current study assessed cognitive attributions using Children's Cognitive Style Questionnaire and depression through Beck Depression inventory, in a sample of 47 children with HFASD and 45 typically developing (TD) controls. Children in the HFASD group were found to exhibit a negative attribution style characterised by higher scores for internality, globality and stability attribution dimensions; and higher scores for depressive symptomatology, compared to the TD group. Attributions were found to be significant predictors of depressive symptomatology in a regression model, for the HFASD group.

Keywords: Attribution, depression, autism, appraisal, cognitive, children with autism.

1. INTRODUCTION

Attribution is defined as differences in emotions experienced that result from stable individual differences in attributing the causes of failure or success in a situation [1]. Theorists [2, 3] also proposed specific causal dimensions which influence the emotions and along which attributions are made: locus of causality that implies whether external or internal factors are perceived to be the cause of success or failure; stability means perceived stability or variability of cause over time; and controllability indicates the extent to which an individual feels in control of a situation's outcomes. People who attribute success to internal, stable and controllable causes; and failure to external, unstable and controllable/specific causes were proposed to be better adjusted. In contrast, individuals who attribute success to external, unstable and uncontrollable causes and failure to internal, stable and uncontrollable were argued to be poorly adjusted [4]. The latter group of individuals is known to exhibit a negative/external attribution style, whereas, the former group demonstrates positive/internal attribution styles. These attribution styles have been shown to have a direct impact on social emotional well-being [5, 6]. Some researchers have also used the term global attribution dimension for controllability dimension, where attributions of low controllability signalled high globality [7].

Researchers have shown that children's attributions are an accurate reflection of their emotions in the situation they are in and that negative attributions are directly predictive of depression [8, 9, 1]. Evidence for the relationship between causal attributions for success or failure outcomes and depressive symptoms largely comes from groups of children without autism e.g., [10, 11]. For example [10] studied a sample of 61, 8-12 year old children and showed a significant and positive association between the attribution dimension of stability and depression. Also, researchers have found evidence of a characteristic negative attribution style in children with depression e.g., [12-15].

In case of children with autism, only two studies by Barnhill [16] and Barnhill and Myles [17] have investigated attributions in relation to depressive symptomatology in children with Asperger Syndrome (AS). Barnhill [16] found a significant association between negative attribution style and depression in adolescents with AS, such that the more adolescents explained the cause of failure by internal factors such as their lack of ability, the higher were their scores for symptoms of depression. Similarly, Barnhill and Myles [17] showed a higher occurrence of depressive symptoms in 33 adolescents with AS who attributed negative events to internal, stable and global causes. A significant association between depressive symptoms and average negative attribution style was also found. The occurrence of depressive symptoms and a negative attribution style might thus be associated in children with HFASD, but from these findings it is not clear which specific attribution dimensions were associated with depression, or if all three were.

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Depression has already been frequently cited as a co-morbid condition with an estimated prevalence rate of 57.6% in children and adults with autism, starting from as early as 4 years of age e.g., [18-21]. For example, children with HFA/AS have been found to have significantly higher scores for depression than TD groups [22-24] and even had comparable levels of depression when considered in relation to children with conduct disorder [25]. Case studies too have indicated occurrence of depressive symptomatology in children and adults with autism e.g., [26-29]. Despite such consistent findings from research studies carried out since early 1980s, there are only limited research findings for the causes of depression in children with autism. The current study will thus investigate the relationship between attribution style and depressive symptoms in children with HFASD.

2. RESEARCH QUESTIONS FOR THE CURRENT STUDY ARE

- Are scores on attribution dimensions of internality, stability and globality significantly different between HFASD and TD groups?
- Are the three attributions significantly associated with appraisal dimensions of emotion-focused coping potential, problem-focused coping potential, future expectancy and self-accountability?
- Are all three attribution dimensions of internality, stability and globality significantly predictive of depression scores in HFASD and TD groups?

3. PARTICIPANTS AND SELECTION PROCEDURES

This study constituted third wave of data collection of a longitudinal study. Two waves of that longitudinal study on cognitive appraisals in children with HFASD have already been published as two separate papers [30-31]. Participants from previous two studies were contacted for the current study. Current study's data collection was scheduled to allow a period of at least six months from the study by Sharma [30] and of one year from the study by Sharma *et al* [31], in order to assess a longer-term association between appraisal dimensions, measured in previous two studies, with attributions measured in the current study.

For studying longer term association of appraisals with attribution style over a period of one year, data were available from 23 children in the HFASD group and 22 in TD group. For the analysis of longer term associations over a period of six months, data were available from 35 children in the HFASD group and 37 in the TD group (see Table **1** for full information).

Table 1: Sources of Recruitment for Participants in Study 3

Participants from both studies: Sharma et al 2014 and Sharma 2014		Participants from Sharma 2014 only	Participants in current study
HFASD	N =23	N=12	N=35
TD	N=22	N=15	N=37

Participant information sheets were posted out to the participant families. The consent forms for parents and children were included in the post along with a stamped-addressed envelope for return to the researcher. Scales for the current study as in the previous study by Sharma (2014) were also administered by telephone. Similar procedures were followed, *i.e.* paper copies of the questionnaires were enclosed in the participant pack for families to refer to, while the researcher administered scales by telephone. This non-standard telephone data collection mode of testing could have biased the findings, so an additional study was carried out.

As part of the additional study, data from new families with a child with HFASD and families with a TD child were collected. Eight children with HFASD and eight TD children were recruited; and the child-report scale used in the current study was administered to all children in both the groups twice: once face-to-face and then again by telephone at a gap of 3-4 weeks. As for studies 1 and 2, data were then tested for a degree of correlation between the face-to-face and telephone testing modes for the HFASD and TD groups, separately. Large, significant correlations ranging from .76 to .94 were found between the two modes of testing for each group. These findings suggested that telephone testing in the sample was unlikely to have biased the current findings.

4.MEASURES AND PROCEDURE

4.1. Children's Cognitive Style Questionnaire (CCSQ)

This is a self-report instrument for measurement of attributions that was developed by Mezulius, Hyde and Abramson [7]. It allows for an assessment of all three attribution dimensions across four different negative social situations. An average score for the attribution style can also be calculated. Mezulius et al. used it for

interviews of children aged 9-11 years old. This questionnaire invited children to imagine being in six different hypothetical scenarios with the purpose of assessing children's cognitive style. Four out of six scenarios were negative in nature, while two were positive and were included to counter-balance the effect of negative scenarios on the general psychological well-being of children during testing. However, children's responses to only the negative scenarios were scored.

Each scenario was followed by five statements assessing the attribution dimensions of internality, stability and globality. Children were invited to rate each of the six scenarios from 0 (*don't agree at all*) to 5 (*agree a lot*). A total score of children's responses to each of the four dimensions in the four negative scenarios was calculated, which was an indicator of composite negative attribution style in children. In addition, a total of scores corresponding to the individual attribution dimensions from each scenario was also calculated to give scores for the three different sub-scales of internality, stability and globality. Cronbach's alpha for all the sub-scales with the participants of the current study was good and ranged from 75-83.

4.2. Birleson Depression Scale

This is a self-report scale, which was designed by Birleson (1981) for assessing depressive symptoms in children aged 7-12 years. This scale consisted of 18 items, which were marked on a scale of *never* (score of 0), *sometimes* (score of 1) and *mostly* (score of 2) for how a child felt during past one week. For the current study, the item "*I think life isn't worth living*" was deleted because of its negative connotation, which could have upset children. The final scale therefore consisted of 17 items. Cronbach's alpha for the modified scale was found to be .80 for the HFASD group and .81 for TD group in the current study.

5. SAMPLE CHARACTERISATION

5.1. Demographic Information

An independent groups *t*-test showed that the mean age of children in the HFASD group (mean = 9.83; S.D. = 1.16) was not significantly different from the mean age of children in the TD group (mean = 9.97; S.D. = 1.04), t (df = 70) = - .51, p= .61. The apparent difference in gender between the two groups was also not significant, χ^2 (df = 1, N= 72) = .44, p = .50.

5.2. CAST Scale

The HFASD group (mean = 19.05, S.D. = .81) had a higher mean value than the TD group (mean = 4.00, S.D. = .80). This difference was significant with a large effect size, t (df = 80) = 78.85, p < .001, d = .95. The cut-off score of 15 or above has been shown to be suggestive of a child being at the risk of developing autism-related symptoms [32]. In the current study, scores for all children in the HFASD group were found to be above the cut off score of 15, ranging from 15-29. On the other hand, scores of all children in the TD group were below 15, ranging from 4-10.

5.3. Vocabulary Sub-Test of WISC-IV

The HFASD group had a similar mean score (mean = 12.27, S.D. = 1.07) to those in the TD group (mean = 12.31, S.D. = 1.13) for the vocabulary sub-test, which was used as a proxy measure for the full scale IQ. There was no significant difference in these mean scores for the vocabulary sub-test between the two groups, t (df = 70) = -.17, p = .86. This finding suggested that cognitive abilities of children in the HFASD group and the TD groups were within normal range. Taken together, findings from the CAST scale and the vocabulary sub-test suggest that children in the HFASD group had symptoms related to autism; and were likely to be of an average IQ. Thus children in the HFASD group had symptoms of high-functioning autism suggesting that children were reliably classified into the HFASD and TD groups.

Table 2: Testing for Potential Responder Bias

Questions on CAST Scale	HFASD Group (from Previous Study)		TD Group (from Previous Study)	
	Took Part (N= 35)	Didn't Take part (N= 7)	Took Part (N= 37)	Didn't Take part (N= 3)
Previous concerns expressed at school	35	7	0	0
Previous diagnosis				
Language delay	0	0	0	0
Hyperactivity/ADHD	1	0	0	0
ASD condition	35	7	0	0
A physical disability	0	0	0	0

5.4. Examination of Responder Bias

Since only 35 out of 42 children in the HFASD group and 37 out of 40 children in the TD group tested during previous studies agreed to take part in the current study, additional information about the developmental history of children from previous studies who did and did not take part in the current study, are shown in Table **2**.

As can be seen in Table **4**, all parents of children from previous study in the HFASD group, who either agreed or did not agree to take part in the current study reported that the teachers or health professionals had expressed concerns about their child's development in past. So, there was no apparent difference for the reported problems in their developmental history at school, between the reports of parents who continued taking part in the current study and who did not.

5.5. Between-group Differences for Attribution Dimensions, Attribution Style and Depressive Symptoms (Research Question 1)

The HFASD group also had significantly higher scores for the attribution dimensions of internality, stability and globality. Difference in mean scores of the HFASD and TD groups were also statistically significant for the average negative attribution style as well as depression scores (see Table **3**).

Table 3: Testing for between Group Differences for Attributions and Depression

Variables	HFASD Group		TD Group		*t*-Test Output
	Mean	S.D.	Mean	S.D.	
Internality	11.51	2.12	5.54	1.75	12.99**
Stability	11.30	1.89	5.69	1.41	14.17**
Globality	10.92	1.71	7.20	2.18	8.08 (p=0.002)
Average attribution style score	54.95	4.96	38.66	4.19	14.88**
Depression	17.65	4.34	6.34	1.61	15.05**

**$p < 0.001$.

5.6. Association between Appraisals and Attributions (Research Question 2)

5.6.1. Association of the Appraisals Assessed a Year Ago, During Study by Sharma et al [31] with Attributions Assessed During Current Study in the HFASD Group

For this analysis, there were 23 children in the HFASD group and 22 in the TD group. As shown in Table **4**, appraisal dimensions of emotion-focused coping potential, future expectancy and self-accountability were each significantly correlated with the three attribution dimensions of internality, stability and globality, and with the average negative attribution style. Emotion-focused coping potential and future expectancy had a negative association with the attribution dimensions and the average attribution style score; but the appraisal of self-accountability had a positive association. The appraisal dimension of problem-focused coping potential was not significantly associated with the attribution dimensions of stability and internality, but was with the globality dimension and the average negative attribution style score. The correlation coefficient for this association was also negative.

5.6.2. Association of the Appraisals Assessed a Year Ago, During Study by Sharma et al [31], with Attributions Assessed During Current Study in the TD group

Results are shown in Table **5**. For the TD group, there were fewer significant correlations between appraisals and attributions. Only the appraisal dimensions of emotion-focused coping potential and future expectancy had negative correlations with the attribution dimensions of internality and stability, and with the negative attribution score. No significant correlations were found between the appraisals of problem-focused coping potential and self-accountability with either the globality attribution dimension or the negative attribution score.

Table 4: Correlation between Appraisals and Attributions, One Year Later, in the HFASD Group (N= 23)

Variables	Internality	Stability	Globality	Average Negative Attribution
Emotion-focused coping potential	-.52 (p= .01)	-.50 (p= .03)	-.49 (p= .03)	-.48 (p= .02)
Problem-focused coping potential	-.12 (p= .64)	-.16 (p= .49)	-.34 (p= .03)	-.18 (p= .04)
Future expectancy	-.81 (p= .002)	-.69 (p= .006)	-.72 (p= .005)	-.70 (p= .005)
Self-accountability	.64 (p= .007)	.68 (p= .007)	.65 (p= .006)	.61 (p= .007)

Table 5: Correlation between the Secondary Appraisals and Attributions, One Year Later, in the TD Group (N= 22)

Variables	Internality	Stability	Globality	Average Attribution
Emotion-focused coping potential	-.20 (p= .04)	-.26 (p= .04)	-.09 (p= .63)	-.18 (p= .04)
Problem-focused coping potential	-.02 (p= .68)	-.06 (p= .39)	-.04 (p= .74)	-.03 (p= .57)
Future expectancy	-.36 (p= .02)	-.31 (p= .02)	-.02 (p= .65)	-.24 (p= .03)
Self-accountability	.03 (p= .72)	.08 (p= .09)	.05 (p= .76)	.01 (p= .67)

Table 6: Correlation between the Appraisals and Attributions, Six Months Later, in the HFASD Group (N= 12)

Variables	Internality	Stability	Globality	Average Attribution
Emotion-focused coping potential	-.26 (p= .11)	-.18 (p= .27)	-.28 (p= .08)	-.30 (p= .06)
Problem-focused coping potential	-.27 (p= .09)	-.40 (p= .01)	-.59 (p< .001)	-.51 (p= .001)
Future expectancy	-.51 (p= .001)	-.66 (p< .001)	-.65 (p< .001)	-.74 (p< .001)
Self-accountability	.44 (p= .006)	.57 (p< .001)	.69 (p< .001)	.69 (p< .001)

5.6.3. Association of Appraisals Assessed Six Months Ago During Previous Study by Sharma [30] with Attributions Assessed in the Current Study in the HFASD Group

Results for the HFASD group are shown in Table **6**. Appraisals of self-accountability and future expectancy were significantly associated with all three attribution dimensions and average negative attribution style. Appraisal of problem-focused coping potential had a significant negative correlation with attributions of stability, globality and average negative attribution style, but non-significant with internality attribution. The associations between appraisals of emotion-focused coping potential and the three attributions as well as the average attribution score were not significant. Nor was the correlation between problem-focused coping potential and internality attribution.

5.6.4. Association of Appraisals Assessed Six Months Ago During Previous Study by Sharma [30] with Attributions Assessed During the Current Study in the TD Group

Results are shown in Table **7**. In contrast to significant correlations found in the HFASD group, only one association was significant in the TD group. In this case, only future expectancy was negatively correlated with the attribution of stability.

Taken together, these findings for both the HFASD and TD groups informed the Research Question 2: that previously measured appraisals (at gaps of one year and six months) had a significant association with the attributions measured during the current study.

5.7. Are Scores on Attributions Associated with Scores on Depressive Symptoms? (Research Question 3)

In a linear regression analysis model scores for the attribution dimensions of internality, stability and globality obtained from the CCSQ scale [7] were entered simultaneously as independent variables, using 'Enter' method in SPSS; and the total score obtained from Birleson Depression Inventory [33] was entered as a dependent variable. This analysis was carried out twice, separately for the HFASD and TD groups. This regression model was found to be a significant predictor of scores on depressive symptoms in the HFASD group, $F (3, 34) = 4.62$, $p = .009$ and explained 23.2% of the variance (Adjusted $R^2 = .232$) in depressive symptoms (see Table **8**).

Table 8: Regression Coefficients for Attributions as the Predictors of the Scores on Depressive Symptoms in the HFASD Group (N= 35)

Variable	B	*t*-Value	*β*
Internality attribution	1.28	5.97 (*p*= .02)	.65
Stability attribution	1.57	9.68 (*p*= .005)	.76
Globality attribution dimension	1.09	4.10 (*p*= .03)	.47

Table 7: Correlation between the Appraisals and Attributions, Six Months Later, in the TD Group (N = 15)

Variables	Internality	Stability	Globality	Average Attribution
Emotion-focused coping potential	-.24 (p= .15)	-.21 (p= .21)	-.09 (p= .60)	-.10 (p= .56)
Problem-focused coping potential	-.05 (p= .73)	-.19 (p= .27)	-.09 (p= .58)	-.01 (p= .94)
Future expectancy	-.04 (p= .78)	-.36 (p= .03)	-.06 (p= .73)	-.08 (p= .61)
Self-accountability	.19 (p= .27)	.02 (p= .87) .	20 (p= .24)	.22 (p= .20)

Regression coefficient values suggested that stability attribution dimension might have largest association to scores on depressive symptoms and globality attribution might have the smallest association. The same model tested in a separate regression analysis was, however, found to be non-significant for the dependent variable of depressive symptoms, in the TD group, F (3, 34) = .47, p = .70. These findings informed Research Question 3 of the current study: that all the three attribution dimensions were significantly associated with scores on depressive symptoms in the HFASD group.

6. DISCUSSION

Findings suggested that a negative attribution style characterised by high scores on the attributions of internality, globality and stability attribution dimensions might be used by children in the HFASD group, in negative situations of the kind presented through the CCSQ scale [7]. These findings add further support to the limited existing research evidence about occurrence of a negative attribution style in adolescents with AS [16, 17]. This suggests that children with HFASD might exhibit a bias in cognitive processing of negative social situations whereby cause of events is attributed to factors internal to themselves and viewed as uncontrollable. Children in the HFASD group as compared to the TD group were also found to have a significantly higher score for depressive symptoms assessed through administration of the Birleson Depression Inventory [33]. Frequent occurrence of depressive symptoms in children with HFASD is also well documented [34] so the current findings add to this literature.

Previously attributions were investigated only in groups with autism without having a comparison group, so a new finding from the current study was that the HFASD group had significantly higher mean scores for all three attributions than the TD group. Higher scores for internality attribution imply that the HFASD group ascribed the outcome of hypothetical situations to causes internal to themselves such as their ability levels or their luck. A higher stability score suggests that children in the HFASD group ascribed the causes of social outcomes as constant over time; while the globality dimension implies that a negative outcome from one social situation may be ascribed to all other similar situations.

Previous research [10, 15] has shown that children who either do or do not believe that failures are caused by their lack of ability differ in their predictions about future outcomes; with the former tending to overemphasise their failures and underestimate their success. The HFASD group in the current study too might thus be relying more on their negative social experiences to guide the prediction and interpretation of future situations and their outcomes.

6.1. Appraisal Dimensions Associated with Attributions over Six Months and One Year Time Periods

In the case of HFASD group, a significant association was found between appraisals of self-accountability and future expectancy assessed a year and six months ago, at previous two studies by Sharma *et al,* [31] and Sharma [30], with attribution dimensions as well as the average negative attribution style score. Self-accountability had a positive correlation with attributions while future expectancy had a negative association. This means that in a situation characterised by high scores on appraisal related to desirable expectancies about future outcome, scores on negative attribution style were low, *i.e.* children in the HFASD group viewed situation in a more positive manner. However, situations with high scores on appraisals related to beliefs about self-responsibility for the cause of an event, scores on negative attribution style were also high. Such an association did not change with time in the HFASD group, as similar correlation coefficients were found at both times for both appraisals studied one year previously [31] as well as six months ago [30].

The other two appraisals of emotion-focused coping potential and problem-focused coping potential examined during the previous two studies [30, 31] were negatively correlated with some attributions. Problem-focused coping potential had negative correlations with globality attribution and negative attribution style; while emotion-focused coping potential (assessed six months ago) had negative correlations with all three attributions and negative attribution style. However, correlation between emotion-focused coping potential assessed a year ago and attributions were found to be non-significant. Thus, the significance of this correlation disappeared at a longer time period of one year.

These findings suggest that the appraisals of low expectancy, high self-accountability and low coping potential may be associated with negative attribution style in the longer term of six months, in the HFASD group. Such a profile of appraisal dimensions was also

associated with negative affect and avoidance coping in a previous study [31]; and also significantly correlated with fear and anxiety in the study by Sharma *et al,* [31]. The occurrence of such appraisals may thus not only be associated with temporary situational distress in terms of negative affect and the ways of coping, but might also be linked to more stable negative cognitive attribution styles.

In contrast, for the TD group there were fewer significant associations between appraisals and attributions. Appraisals of future expectancy and emotion-focused coping potential, assessed a year ago [31] had a significant negative correlation with two out of three attributions: internality, stability, and average attribution style score. However, the only significant correlation found at a shorter time gap of six months [30] was between future expectancy and stability attribution. Two implications can be argued from these findings: One that situations that are appraised as low in expectancy are also characterised by more stable beliefs about occurrence of such negative situations in future. Second, a longer time gap between assessment of appraisals and attributions revealed a higher number of significant associations in case of the TD group; whereas an increase in time gap had reduced the number of significant correlations between appraisals and attributions for the HFASD group.

A new finding from the current study is that impaired appraisals may be associated with negative attributions in both HFASD and TD groups in the long-term.

6.2. Association between Attributions and Depression Symptoms

Scores on depressive symptoms of the HFASD group were significantly associated to the scores on attribution dimensions. This implies that negative social situations which are ascribed to internal, stable and global causes by the HFASD group might also be characterised by higher scores for depression symptomatology. In previous research too, use of negative attribution style characterised by high internality, stability and globality was shown to be associated with depressive symptoms in negative situations, both for group with [16, 17] and without autism (7; 35). Current findings therefore not only add to existing literature on relation between negative attribution style and depressive symptoms in children with HFASD, but also extend it to the findings on relation between specific attribution dimensions and depressive symptoms. Further, out of the significant associations of the three attributions with depressive symptoms in the HFASD group, stability attribution dimension had the largest association to the scores on depressive symptoms. However, globality attribution had the smallest association to depression symptoms. It is thus likely that how children in the HFASD group attributed the cause of a situation was somehow linked to their mental health and well-being.

Association between attributions and depressive symptoms was however not significant for the TD group. This finding is consistent with previous findings about non-significant correlation of appraisals with negative emotions in the TD group [30]. This is once again a curious finding, as previous research studies have shown a significant association between attributions and depressive symptoms in TD children e.g., [10]. Could it be the case that these findings of non-association of appraisals with negative emotions and avoidance coping, and of attributions with depressive symptoms are only specific to the group of TD children who took part in the current research? This is a question that needs answered through further research.

6.3. Limitations

For studying attribution dimensions, CCSQ scale was employed. Children's cognitive attributions were thus assessed in specific artificial situations. Children's scores on attributions were obtained through their responses to six artificial, hypothetical negative social and academic situations (CCSQ scale; 14); so the findings here might not accurately indicate children's attributional reasoning in other real-life situations. Another limitation relates to assessment of longer-term association between appraisals and attributions which would have been stronger if both these variables were assessed at both times, *i.e.* both variables of appraisals and attributions measured at all three times: the current study, previously conducted studies by Sharma [30] and Sharma *et al* [31]. This would have allowed further insights into the extent to which correlation between appraisals and attributions is stable across time and if there is any change over time period of one year and six months. However, designing such an analysis would need to take into consideration the possible time demands on the participants.

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