CHAPTER XI

SUMMARY AND CONCLUSIONS
INTRODUCTION

Search for moderators that bridge the void between academic achievement and potential mental ability has continuously intrigued the thinking of researchers for about four decades. Particularly, the current interest in the preservation of talent and regain of the lost talent has increased the urgency with which attempts are being made to find out the key mediators. These mediators in the form of behaviourial-environmental factors need to be assessed as they are likely to be differentially related to the different levels of discrepant academic achievement. Besides, these can help diminish the margin of error in the prediction of academic achievement.

THE PRESENT STUDY

The present study entitled "Characteristic Behavioural and Environmental Correlates of Academic Achievement of Over- and Under-Achievers at Different Levels of Intelligence", was oriented towards the furtherance of scientific knowledge about non-intellectual behaviourial-environmental correlates of academic achievement throughout the total range of achievement and ability, academic over- and under-achievement, that is, two levels of discrepant academic achievement spread through the entire range of ability as well as when it was divided into three levels (low, average and high intelligence). In
this investigation, 'oversachievers' were defined operationally as those individuals whose actual achievement scores were one standard error of estimate above their predicted scores, whereas 'undersachievers' were defined as those individuals whose actual achievement scores were one standard error of estimate less than their predicted scores. The achievement scores were predicted on the basis of intelligence.

The study was pivoted around the framework of the following hypotheses:

1. Certain behavioural and environmental correlates of academic achievement are 'common' to (i) the total group (total final sample), oversachievers and undersachievers or (ii) common to at least two of these groups.

2. Certain behavioural correlates of academic achievement are 'specific' to the total group or oversachievers or undersachievers.

3. Significant variance towards academic achievement is contributed by major behavioural and environmental measures, that is, adjustment, personality, study habits and attitudes, achievement motivation, interests and socio-economic status for the total group, oversachievers and undersachievers.

4. Behavioural and environmental measures contribute differentially to the prediction of academic achievement of the total group, oversachievers and undersachievers individually within the group and from group to group.
4. Behavioural and environmental measures contribute differentially to the prediction of academic achievement of the total group, oversachievers and undersachievers individually within the group and from group to group.

5. Certain behavioural traits and environmental conditions, combine in specific constellations to yield common factor or factors with academic achievement of the total group (total final sample).

6. The constellation of behavioural traits and environmental conditions of the two contrasting groups of discrepant academic achievement, that is, oversachievement and undersachievement differ from each other as well as from the total group.

7. Significant mean differences exist between over- and undersachievers when compared at the same level of intelligence in respect of certain behavioural and environmental measures.

8. Significant mean differences exist among over- or under-achievers at different levels of intelligence in respect of behavioural and environmental measures.

9. Significant mean differences exist among the total group (TFS), total groups of over- and under-achievers and over- and under-achievers at three different levels of intelligence in respect of certain behavioural and environmental correlates (including common correlates of academic achievement.)
METHOD AND PROCEDURE

To test the above hypotheses, the study was designed and advanced through two phases. In the first phase, identification of over- and under-achievers was made out of a sample of 2414 ninth grade students who were selected on the basis of multi-staged randomization of clusters. Identification of over- and under-achievers was made with the help of regression prediction method. For the sake of studying the total achievement range, however, a representative sample of average achievers was also selected. This led to the identification of the total final sample consisting of 264 overachievers, 278 average-achievers and 219 underachievers. These three groups were further divided on the basis of levels of intelligence, that is, low, average and high, their cut off points being 27 per cent, 46 per cent and 27 per cent respectively. This was done on the basis of combined DIOs of the two intelligence tests (verbal and non-verbal). The t-test of significance was applied to ensure that the total final sample and over- and under-achievers were equated on intelligence, whereas they markedly differed in achievement. This was also applied to justify the similarity in intellectual level and dissimilarity in achievement levels of over- and under-achievers at each of the three levels of intelligence. This provided the rationale of the present study that there are intervening variables which affect one-to-one correspondence between ability and attainment.
In the second phase, three-staged analyses of correlates of academic achievement were done. In the first stage, behavioural and environmental correlates of academic achievement were examined in respect of the total final sample which represented the normal distribution of entire range of achievement as well as that of intelligence.

In the second stage, behavioural and environmental correlates of academic achievement of over- and under-achievers were studied.

In the third stage of the second phase of study, the position of such behavioural and environmental correlates of academic achievement of over- and under-achievers was examined at three different levels of intelligence.

The statistical design consisted of multitrait-multimethod approach. The whole study centred around the two main objectives:

Firstly, to get a 'global picture' of behavioural and environmental correlates of (i) the total final sample, (ii) oversachievers, (iii) undersachievers, and (iv) comparative picture of (i), (ii) and (iii). For this purpose, statistical techniques of multivariate correlation and multivariate factor-analysis were adopted.

Secondly, to get the analytical picture of the behavioural and environmental correlates at all the stages mentioned above together with the correlates of academic
achievement of over- and under-achievers at three levels of intelligence. For this purpose, statistical techniques that were resorted to were bivariate correlational analysis, t-values and mean profiles.

The tools employed for the identification of over- and under-achievers from the original sample (N = 2414) were the two intelligence tests, that is, (i) Raven's (1960) Standard Progressive Matrices (non-verbal) and (ii) Jalota's Group General Mental Ability Test (verbal). The scores of these were combined by converting them into DIs. The criterion measure of prediction was taken in terms of scores obtained in the Middle Class Final Examinations held by the Punjab School Education Board.

In all, six tools were employed to identify the correlates of academic achievement, over- and under-achievement and over- and under-achievement at different levels of intelligence. These were: (i) Mittal's Adjustment Inventory; (ii) Jr.-Sr. High School Personality Questionnaire by Cattell; (iii) Test of Study Habits and Attitudes by Joshi and Pandey; (iv) Projective Test of Achievement Motivation (a part of AAPAS) by Kureshi (1971); (v) Chatterji's Non-Language Preference Record (Form-962); and (vi) Socio-Economic Status Scale Questionnaire by Jalota, Pandey, Kapoor and Singh.

The final data collected with the help of the above tools led to the obtaining of thirty-four raw scores for each of the students in the final sample (N = 761). Out of
the first five scores corresponded to five areas of adjustment (HA, SA, HEA, SCA and TA); next fourteen scores corresponded to fourteen dimensions of personality (A, B, C, D, E, F, G, H, I, J, O, Q2, Q3 and Q4); twentieth measure represented socio-economic status (SES); twenty-first score represented study habits and attitudes (SHA); next three scores corresponded to three measures of achievement motivation (S1AM, S2AM and TAM); and the last ten scores concerned the ten different areas of interest (FA, LIT, SC, ML, AG, TECH, CR, OD, SP, MH).

RESULTS

But for minor manual calculations, all the results were obtained directly from the computer. Descriptive statistics and F-values (with the help of correlation ratios or eta coefficients) for all the score distributions of the total initial sample, total final sample, oversachievers and undersachievers were found out so as to test the normality and linearity of score distributions pertaining to each of the variables under consideration.

A variety of statistical techniques was employed for testing the first six research hypotheses. Single factors, combination of factors and factor constellations were studied to find out the behavioural and environmental correlates of the total final sample, oversachievers and undersachievers. To obtain these results, bivariate correlational analysis, multivariate correlational analyses and multivariate factorial analyses were employed. Bivariate
correlations helped in finding out the 'common' and 'specific' behavioural and environmental correlates of academic achievement of the total final sample, over-achievers and under-achievers. Multivariate correlational approach led to the finding out of variance in achievement accounted for by different measures in different combinations. For factor analysis, Hotelling's (1935) Principal component method was used which led to the identification of differential factor-structure of behavioural-environmental variables in the context of academic achievement for these groups.

The last three hypotheses were tested by using t-test and mean profiles with a view to obtaining an analytical picture of behavioural and environmental correlates of the total sample, over- and under-achievers and over- and under-achievers at different levels of intelligence and to make their comparisons.

CONCLUSIONS

NATURE OF THE DATA

Some of the major general conclusions warranted by the empirically obtained data of the present study are given below:

The phenomenon of over- and under-achievement existed as a consequence of normal variations between individuals and underachievement was not a 'matter of pathology' (Yule et al., 1974).
Overachievement and undersuccess existed at

equal frequency.

No sex differences were observed with regard to

achievement and intelligence \((DIO_{comb})\) of over- and

under-achieving boys and girls as well as when they were

further split on the basis of levels of intelligence.

On the basis of descriptive statistics it was

observed that the score distributions in respect of
different measures for the total final sample and over-

and under-achievers were nearly normal with minor devi-

ations.

The linearity of the different independent mea-
sures on the criterion was also ensured in most of the
cases but for a few exceptions. The measure of study

habits and attitudes was found to bear non-linear relation-

ship with the criterion for all the three groups, that

is, total group, overachievers and undersuccesses.

As evinced by the findings provided by the testing
of the nine hypotheses of the present study, the following
conclusions were crystallized.

GLOBAL PICTURE OF CORRELATES

Thirty-four different behavioural and environmental

measures contributed differentially to the prediction of
academic achievement of the total group, over- and under-
achievers within the group and from group to group. 'Full
Model' regression equation of these variables showed that
overshining group proved to be maximum predictive, its coefficient of multiple determination being .4698. Total final sample proved to be equally predictive, yielding coefficient of multiple determination to be equal to .4558. The least predictive group out of the three was that of underachievers which led to the obtaining of coefficient of multiple determination equal to .3333. Hence criterion measure could be predicted to the extent of 45.58, 46.98 and 33.33 per cent for the total final sample, overshiners and underachievers respectively. Thus, when intelligence was controlled, non-intellectual behavioural and environmental measures contributed to an increase in precision of estimating the criterion.

Comparison of different Models of multiple correlation provided that significant variance in academic achievement of the total sample was contributed by all the six major behavioural and environmental domains (adjustment, personality, study habits and attitudes, achievement motivation, interests and socio-economic status). Significant variance in academic achievement of overshiners was contributed by quintuple constellation of five behavioural and environmental measures (adjustment, personality, achievement motivation, interests and socio-economic status). Significant variance in academic achievement of underachievers was contributed by only three major behavioural areas (adjustment, achievement motivation and study habits and attitudes).
Differential factor structure of the total group, over- and under-achievers amply confirmed the findings that certain behavioural traits and environmental conditions combine in specific constellations to yield common factor/factors with academic achievement of the total sample, over-achievers and underachievers. Even if the factor-labels were the same, the three major groups (TPS, OAs and UAs) differed in the magnitude and direction of significant loadings of different factors.

ANALYTICAL PICTURE OF CORRELATES

Results based on zero order correlations between the criterion and the independent variables showed that out of a large pool of thirty-four non-intellectual behavioural and environmental measures, which were assumed to be related to academic achievement, eleven measures, that is, better school and total adjustment, higher self-concept control, better socio-economic status, effective study habits and healthy attitudes, higher achievement motivation and lesser interest in fine arts and household work (SCA+, TA+, B+, Q+3, SES+, SHA+, $S_1$AM+, $S_2$AM+, TAM+, FA- and HH-) were found to be the common correlates of academic achievement of the total sample as well as over- and under-achievers. But though these measures were associated with better attainment of all these major groups, yet the magnitude of zero order correlation of these measures differed from one group to another.
'Reduced Model' based on multivariate correlational analysis of these common correlates led to the obtaining of differential values of $R^2$, that is, .4169, .3800 and .2536 for the total sample, over- and under-achievers respectively. Percentage of variance explained by each of these eleven measures also differed from one group to another.

Factor structure of the total sample, overachievers and underachievers proved that these common correlates combined in different configurations and led to differential contribution towards the explaining of common factor variance of different factors.

t-test helped in finding out the mean differences of different measures between the total sample, overachievers and underachievers and their comparative position when over- and under-achievers were studied at three different levels of intelligence. Comparison of six pairs of groups, that is, total sample and overachievers, total sample and underachievers, over- and under-achievers and over- and under-achievers at low, average and high level of intelligence (TFS-OAs, TFS-UAs, OAs-UA$^a$, OA$_h$-UA$_h$) revealed very enlightening results, which showed that though these eleven measures were significantly and commonly associated with the academic achievement of the total group as well as over- and under-achievers, significant mean differences were observed between the six pairs of groups for seven measures,
that is, overachievers pretended significantly higher means than total final sample or under-achievers with regard to measures of school adjustment, total adjustment, scholastic mental ability (Factor 'B') study habits and attitudes, achievement motivation expressed through two measures (S\textsuperscript{2AM} and T\textsuperscript{AM}) and socio-economic status. Another measure of achievement motivation (S\textsuperscript{1AM}) also showed higher mean scores for overachievers than the total group or underachievers except between over- and under-achievers of low intelligence. Common correlate of self-concept control (Factor Q\textsubscript{3}) showed higher mean scores for over-achievers than the total group or underachievers but the difference was not statistically significant between total group and overachievers or underachievers and also between over- and under-achievers of high ability. Negative common correlate of household work showed significantly higher mean scores of underachievers than the total group or over-achievers or overachievers of average and high level of intelligence as compared to their parallel groups of under-achievers. Negative common correlate of interest in fine arts showed higher mean score of the total group and under-achievers than overachievers at all levels of study but differences between six different pairs of groups were not significant except between over- and under-achievers of low level of intelligence where underachievers obtained significantly higher mean scores. So it can be safely concluded
that though there may be common correlates of academic achievement or over- and under-achievement yet significant mean differences can still differentiate between the total group and over- and under-achievers or over- and under-achievers at different levels of intelligence.

Two correlates of better home and social adjustment, again, showed that though these were commonly associated with academic achievement of the total group and over-achievers, yet overachievers obtained significantly higher mean scores than the total group as well as underachievers at all levels of intelligence, except for over- and under-achievers of low level of ability, where the mean differences for the measure of social adjustment did not reach a statistically accepted level of significance.

Two correlates of phlegmatic dimension of personality and negative interest in craft-centred activities showed that these were commonly associated with academic achievement of the total group and underachievers. Common negative correlate of craft-centred activities differentiated between mean scores of the total group, over- and under-achievers and over- and under-achievers at three different levels of intelligence. Common correlate of phlegmatic dimension of personality did not differentiate between the total group, over- and under-achievers and over- and under-achievers at different levels of intelligence except for over- and under-achievers of average ability. Thus, it can be concluded that a common correlate does not necessarily warrant mean differences between different pairs of groups.
Out of these common correlates, mean differences between over- and under-achievers at different levels of intelligence demonstrated significant increase from low ability to average to high ability in respect of total adjustment, study habits and attitudes, interest in household activities and socio-economic status. The same was true for home adjustment which was found to be a significant common correlate of the total sample and over-achievers. The reverse trend was observed in case of the measure of self-concept control (Factor 0), that is, as the intellectual ability decreased from high to low, mean gains of overachievers increased for self-image and self-respect. In other words, decrease in ability was followed by increase in Factor 0 for overachievers.

Out of an obtained syndrome of six specific correlates of academic achievement of the total group, that is, better health and emotional adjustment, obedience, happy-go-lucky trait, strong super-ego strength, venturesomeness and negative interest in technical activities, very few mean differences between the total group and over- and under-achievers, or over- and under-achievers at different levels of intelligence were observed except for measure of health and emotional adjustment where overachievers showed higher mean score than the total sample, total group of undersachievers and undersachievers of average intelligence.

Two specific correlates of academic achievement of overachievers, that is, reservedness and toughmindedness.
showed no mean differences between the total sample and over- and under-achievers or over- and under-achievers at different levels of intelligence except for over- and under-achievers of average ability where over-achievers achieved higher mean scores than the under-achievers.

Two specific correlates of academic achievement of underachievers, that is, self-sufficiency and negative interest in agricultural activities again showed no mean differences between the total sample, over- and under-achievers and over- and under-achievers at different levels of intelligence.

Thus, it can be concluded on the basis of these results that a measure may be a common correlate of different groups yet significant mean differences might exist or a measure may be a specific correlate of a particular group and yet no mean differences might be therebetween that group and other groups.

Besides 'common' and 'specific' correlates of academic achievement of the total sample, over- and under-achievers, personality dimension of emotional stability, tenseness, interest in literary, scientific, medical, outdoor and sports activities proved to be redundant measures which did not correlate with either the total sample or over-achievers or under-achievers. All these measures did not show any significant mean differences
between the total group, over- and under-achievers and over- and under-achievers at different levels of intelligence. Results of multiple correlation showed that these measures accounted for very little variance in the criterion.

Significant mean differences observed between over- and under-achievers belonging to three different levels of intelligence provided empirical evidence to the fact that overachievers and underachievers in themselves were heterogeneous groups and could be differentiated within themselves at different ability levels.

Though the factor of intelligence was controlled between the total group, over- and under-achievers or between over- and under-achievers at each of the three levels of intelligence, throughout the study, yet Factor B (crystallized intelligence) of personality proved to be contributing significantly to the explaining of variance in academic achievement of the total group and overachievers. This measure, however, did not significantly add to the explained variance in attainment of the underachievers.

One of the major conclusions drawn on the basis of empirically obtained results was that multiple R's did not increase dramatically with the addition of independent measures from six in 'Mini-Model' to eleven in 'Reduced Model' and thirty four in 'Full Model'. Multiple R's for the total group were .629, .646 and .675 for 'Mini', 'Reduced' and 'Full' Models respectively. Lastly, multiple R's for the underachievers were .479, .504 and .577 for 'Mini', 'Reduce' and 'Full' Models respectively. Thus multiple R's
of six common correlates of the total sample, over- and under-achievers (Mini Model), that is, better school adjustment, higher scholastic mental ability, better study habits and healthy attitudes, higher achievement motivation, lesser interest in household work and higher socio-economic status, each measure representing one major behavioural or environmental measure, showed that they can be equally effective in predicting the criterion measure and differentiated between means of the total group, over- and under-achievers and over- and under-achievers at different levels of intelligence; overachievers obtaining higher mean scores than the total group or the underscapers for all measures except for the measure of household work where the underscapers showed higher mean scores than the total group or the overachievers.

The results of the present study lead to infer that although the spectrum of some of the non-intellectual behavioural-environmental factors is differentially related to academic achievement of over- and under-achievers, yet single factor, combination of factors and factor constellations are not capable in themselves of clearly separating over-achievers and underscapers. Indeed, on the basis of results obtained by bivariate and multivariate analyses involving one factor or a combination of factors at a time, it is clear that certain factors or factor combinations or configurations are common to those groups which differ widely in achievement. These can be named as correlates of academic achievement which
operate for both positive or negative discrepant academic achievement as well and which can be safely extended to discrepant academic achievement groups of low, average and high levels of intelligence. Still significant mean differences, and significant differences in variance accounted for by 'common' correlates show that these correlates do not play identical role in different groups. Rather these are, in a way, differentially related to them.