

EXPLANATORY STYLE , EGO-ORIENTATION , AND PRIMARY SCHOOL
MATHEMATICS ACHIEVEMENT

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Running head: Optimism and mathematics achievement

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Abstract

This project was concerned with the relationship between children's explanatory style (optimism vs. pessimism) and achievement in mathematics indexed by the Progressive Achievement Test. One hundred and 45 children from grades 4, 6 and 7 (aged 8 to 12 years) participated as subjects. The Children's Attributional Styles Questionnaire (CASQ) correlated significantly ($r=.34$) with current achievement, and scores on the negative subscale of the CASQ correlated with achievement data collected 2 and 3 years previously. On a further questionnaire

concerned with motives for learning, optimistic children endorsed task-orientation goals whereas, ego-orientation goals were endorsed by both optimistic and pessimistic children. Significant sex differences were found on the CASQ, with a greater number of boys displaying a relatively depressogenic pattern.

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Optimism, the simple belief that positive events outweigh the negative, is widely respected as a normal, natural, and healthy personality attribute. Characterological differences between optimists and pessimists have been recognized for centuries within popular culture, literature, and humour. More recently, ways to discriminate optimists and pessimists have been

developed by researchers who have begun to investigate questions such as the following. Do the commonly identified differences between optimists and pessimists extend beyond simple beliefs to encompass more significant aspects of personal adjustment? What role does dispositional optimism play in motivation and learning? To what extent are optimistic and pessimistic tendencies formed during childhood? Can optimistic tendencies impact upon one's health or illness recovery? In the present study we sought to investigate the relationship between preadolescent children's optimism and aspects of their achievement and motivation in the area of mathematics.

Within the research literature, three separate methods of assessing children's optimism have emerged: the vignette method, the direct approach, and the explanatory style (i.e., attributional) method. Stipek published two studies using a procedure suited to young children. Individually, each child is asked to respond to a series of brief incomplete vignettes by predicting the most likely of two possible outcomes (Stipek, 1981; Stipek, Lamb, & Zigler, 1981). The vignettes depicted events occurring to peers, and responses are scored according to the frequency of positive outcomes nominated.

The direct questionnaire method has been used with elementary school aged children (Fischer & Leitenberg, 1986), and with college, adult, and clinical samples (see Scheier & Carver, 1992 for a review). The procedure involves asking respondents to rate themselves on items such as "I'm always optimistic about my future" and "I will always be successful in the long run". Within this approach optimism is described in terms of generalized expectancies which constitute a stable disposition to believe that one will experience or achieve favorable outcomes in most future situations. Understandably, the direct measures reveal correlations between optimism and other indices of self-

functioning such as self-esteem, self-percepts of ability, and subjective well-being. At the adult and clinical level, optimism has also been associated with and predictive of relatively successful coping and recovery indices in aspects as diverse as stress in university life, mental health, cancer illness, myocardial infarction, severe surgery, need for medication, and health-enhancing activities (Scheier & Carver, 1992).

Use of the direct method with children reveals the interesting point that virtually all children are natural optimists, at least in terms of holding expectancies about the future. The raw data display extreme levels of negative skewness in that the majority of children (at least up to around 12 years) attain virtual ceiling scores. Reversing item valence for some questions does not alter this characteristic. Indeed, Fischer and Leitenberg (1986) reported that positive and negative items clearly loaded on separate factors, with both dimensions evidenced extreme skewness.

The explanatory style analysis, stemming directly from helplessness theory, approaches the problem from a remarkably different perspective. Rather than define optimism in terms of expectancies concerning the future, this approach focuses upon the individual's characteristic patterns of perceptual encoding and attribution. One of the well-verified assumptions of attribution theory is that individuals engage in mental cause-and-effect analyses. But helplessness theory (Seligman, 1990) takes this notion one further step in postulating that individuals differ in their characteristic patterns of causal search, notably in the inferences and mental constructions they derive from this process. Three fundamental dimensions which underscore the way different people are likely to form attributions have been documented. They are stability (permanent or temporary), pervasiveness (context-limited or global), and personalisation (internal or external).

Helplessness theory predicts the following sequence. In

response to an unpleasant experience under ambiguous circumstances a pessimist is inclined towards constructing attributions that reflect permanent attributes, pervasive characteristics (i.e., factors whose impact extends well beyond the immediate context), or personal liabilities (i.e., self-blame or the lack of a valued characteristic). By contrast, an optimist's attributions are more likely, under similar provocation, to fix upon aspects that are more transient, more specific, or less directly the natural consequence of one's personal defects. In the view of Seligman, "Your habitual way of explaining bad events, your explanatory style, is more than just the words you mouth when you fail. It is a habit of thought, learned in childhood and adolescence.... It is the hallmark of whether you are an optimist or a pessimist" (1990, p. 44).

The Attributional Styles Questionnaire (ASQ) has become the major instrument used in explanatory style research. Several different versions of the ASQ have been developed including a children's version (CASQ), suited for ages 8 to perhaps 15 years. One interesting feature of the CASQ is that it incorporates items concerned with attributions for both positive and negative events. To date, most of the published studies using this scale has been concerned with correlations between CASQ scores and pathological indicators. The relationship between explanatory style and depression became a major research focus within clinical psychology, giving rise to the well-articulated hopelessness theory of depressive functioning (Abramson, Metalsky, & Alloy, 1989).

Seligman, Peterson, Kaslow, Tanenbaum, Alloy, and Abramson (1984) reported significant correlations between CASQ data and a children's depression inventory in a sample of school children 8 to 13 years. They also found that CASQ scores correlated with mother's (but not father's) ASQ scores and adult depression scores. More recently, however, Vanden Belt and Peterson (1991) found significant relationships between adults' scores (both mothers and fathers) on a specially developed version of the ASQ concerned with solving parenting problems, and several indices of their children's behaviour in school obtained via teachers' ratings. The children in the sample were kindergarten to grade 6. Especially salient was a reported correlation of -0.42 between rated academic achievement and the parents' ASQ score for negative events. Put bluntly, this study found that children who were rated by teachers as being poor on academic and social adjustments came from homes characterized by pessimistic adult cognition.

The finding of significant correlations between CASQ data and children's self-rated depression has been confirmed at the elementary school level (Nolen-Hoeksema, Girgus, & Seligman, 1986; 1991; Panak & Garber, 1992), at the high school level (Dalley, Bolocofsky, Alcorn, & Baker, 1993; Garber, Weiss, & Shanley, 1993), and in clinical samples (Asarnow & Bates, 1988; Kaslow et al., 1988). The Nolen-Hoeksema et al. (1986) project is of particular interest in that, through repeated measurements over a year, they were able to document bidirectional effects between explanatory style and depression. Low scores on the CASQ were predictive of increased depression on later occasions. Also, current depression levels predicted adverse changes in explanatory style. Such findings are consistent with hopelessness theory that postulates that depression follows on from the interaction of (a) pessimistic explanatory style, (b) automaticity in negative affect and judgments, and (c) aversive life experiences (Abramson et al., 1989).

The hopelessness theory of depression has recently been gaining support from other research. In Garber et al.'s (1993) study using a sample of over 400 high school children, CASQ

scores actually correlated -0.42 with a clinical measure of negative thought automaticity. Panak and Garber (1992) found that

CASQ scores, when taken together with peer rejection indices, presaged significant rises in depression levels in 3rd, 4th, and 5th grade children. Such data suggest that explanatory styles measures tap into powerful personality dynamics operating during the formative years of childhood and adolescence. The existing studies indicate these dynamics are well set in place by 8 years of age.

In the present study we were interested in the relationship between children's CASQ indices and achievement on a standardized mathematics test. We were prompted by one of the incidental findings embedded in the Nolen-Hoeksema et al. (1986) paper that there was a significant correlation of -0.26 between CASQ data and scores on the California Achievement Test. At the university level, Peterson and Barrett (1987) had found a correlation of 0.36 between academic grades and a specially developed ASQ measure, and Peterson (1990) also refers to several as yet unpublished projects yielding similar findings with other samples of college students. Thus, the relationship between attributional style and achievement at the primary school level demands further investigation.

In addition to the CASQ we were also able to administer a questionnaire concerned with children's motive structures in mathematics following on from the theory that learning in social contexts is motivated by ego-relevant factors as well as by the need to achieve understanding. Researchers refer to this as the distinction between ego-orientation and task-orientation (Ames, 1992), a distinction that can be conceived of in either trait-like or context-induced terms. In brief, ego-oriented children strive to attain self-worth via their ability to perform better than a psychological reference point normally defined by the level of performance of their peers. By contrast, task-oriented children are interested in (i.e., pay attention toward) genuine advances in learning, understanding and personal mastery, rather than in social comparisons.

A substantial body of research has validated the performance vs. mastery distinction (see review by Ames, 1992), although it is important to appreciate that, at the level of the individual response, the two types of goal are not necessarily in opposition. Measures of ego-orientation and task-orientation tend to intercorrelate positively, albeit at low, often nonsignificant, levels. Furthermore, as personal goal orientations, ego-involvement and task-involvement have been shown to exist relatively independently of ability measures. However, the available evidence clearly indicates that task-orientation is associated with a pattern of personal response and attentional deployment likely to enhance motivation in the face

of adverse circumstances.

By contrast, ego-involving responses can give rise to an unhealthy focus upon personal vulnerabilities in similar challenging circumstances (Elliott & Dweck, 1988). In a recent study, for example, Boggiano and Barrett (1992) found that 8-year-olds who exhibited an extrinsic (i.e., ego-oriented) motive pattern also exhibited relatively high levels of negative emotion and feelings of hopelessness and self-blame. When circumstances lead people, including children, to appraise their competencies and evaluate themselves against shifting external standards, self-doubt and its associated emotions seem to emerge very easily.

We began with the assumption that children who score at low levels on the CASQ (i.e., pessimists) would also have a tendency to be relatively ego-oriented in relation to schoolwork. Ability factors are central to the attentional focus of ego-involvement, and children are likely to conceive of ability in terms of relatively fixed personal attributes. Although task-orientation is, in broad terms, a relatively "optimistic" mental frame, whether or not this trait would relate meaningfully to individual

differences in explanatory style, as defined within the specific framework of helplessness theory, is a question open to investigation. Whilst helplessness theory and goal theory are concerned with similar issues, they differ, as we have indicated, with regard to the underlying psychological mechanisms they invoke.

METHOD

Subjects

In all, 145 children (82 boys and 63 girls) participated as subjects. They represented 5 intact classes at a primary school in metropolitan Adelaide, whose teachers had responded to a request from the school principal at an open staff meeting. Of the final sample 52 were from grade 4, 51 were grade 6, and 42 were grade 7. The median ages of the children at each of the three grade levels were 9.2 years, 11.2 years, and 12.1 years. The 5 classes emerged from a possible pool of 8 classes, and the school did not practice class level ability streaming. Questionnaire data from a few of the children were missing due to natural absences from class on days of the testing, and this accounts for slight variations in *n* within some of the analyses.

Questionnaires and procedures

Motivational measures. The first questionnaires were administered to intact classes in February 1993. The "Your

feelings in mathematics" questionnaire (FMQ, see table 1) is designed to assess dispositions towards ego-orientation (6 items) and task-involvement (9 items) in addition to having several fillers. The FMQ is a variant of the Motivation Orientation Scales developed by Nicholls (Duda & Nicholls, 1992; Nicholls, Cobb, Wood, Yackel, & Patashnick, 1990) Using slightly different forms of the FMQ, we have collected data from several samples of primary school children, totaling over 600 respondents. Factor analyses consistently indicate the integrity of the dimensions which in our samples have intercorrelated around 0.25. In the present sample the internal reliability alpha coefficients were 0.80 for the ego scale and 0.84 for the task scale. Experience with this instrument has revealed that an unacceptable proportion (about 15%) of younger (grade 3) children obtain maximum scores on both dimensions, and both dimensions evidence a degree of negative skewness. In future versions we intend to revise some of items and to use different fillers to try to reduce these problems. In preliminary analyses we used data transformations to remove the skewness, but the statistical relationships with other variables were unaffected and so this procedure was deemed unnecessary.

Insert table 1 about here

In the present form of the FMQ 8 filler items were used. Naturally, these items did not form any coherent factor structure, except we noted that five of the fillers actually did load on the task-orientation factor. For this reason we decided to enter these items into the analyses as separate attitudinal response variables (see table 3).

Explanatory style measures. The Children's Attributional Style Questionnaire (CASQ) was administered during a normal class session in March 1993. We modified the wording of the original instrument in several places to eliminate American colloquialisms, but these changes were minor, and we regard this version as the equivalent to that published by Seligman (1990). The CASQ is a 48-item forced choice instrument derived from

learned helplessness theory. Twenty-four positive events and 24 negative events are posited, and the child is asked to decide between two possible attributions. One alternative reflects either a permanent, pervasive, or personal (i.e., self) attribution, and the other alternative reflects either a temporary, restricted or non-personal attribution.

By way of illustration, item 33 asks the child to imagine "A team you are on loses a game". The two response options are "The team does not play well together" and "That day the team members didn't play well together". In this example the first option

represents a relatively stable (i.e., permanent) attribution, and so this item contributes to the permanent/negative subtotal. The CASQ yields three major scores. Firstly, the positive and negative items are tallied separately, and then a composite score is obtained by subtracting the negative from the positive score. In line with helplessness theory, a high composite score represents optimistic explanatory style, whereas a low score represents pessimistic explanatory style.

Mathematics achievement data. Achievement test data were available through access to school records. The school's informal policy is to encourage teachers to administer the mathematics scale of the Progressive Achievement Test (PAT) to intact classes at the beginning of each school year (i.e., early February). For purposes of diagnostic screening. Thus, achievement data were available for the entire sample in the current year (PAT93), for 77 children in the previous year (PAT92), for 53 children two years previously (PAT91), and for 54 children three years previously (PAT90). To enable data analysis to proceed we converted the raw scores to standard scores within each grade level, using mean and deviation points from the entire school record data aggregated within each grade over four years. The PAT is a widely used achievement test in Australia and New Zealand, developed and published by the Australian Council for Educational Research and the New Zealand Council for Educational Research..

results

Preliminary analyses. Our initial analyses tested for possible age (i.e., grade) and sex differences on all response variables. A significant sex effect was found on each of the three CASQ indices. Relative to boys, the girls evidenced higher positive scores (means of 13.53 and 12.45, $F(1,130)=4.31$, $p<.05$), lower negative scores (means of 6.13 and 7.78, $F(1,130)=10.13$, $p<.01$), and higher composite scores (means of 7.41 and 4.68, $F(1,130)=13.66$, $p<.001$). Interestingly, 9 of the 82 boys (12%) obtained a composite score less than zero, whereas not a single girl did so. This is significant in that Seligman comments that if a boy obtains "less than 1 he is very pessimistic and at risk for depression" (1990, p. 125). No additional age, sex, or interaction effects were evident on any of the other measures.

Insert table 2 about here

Correlational analyses. The pattern of primary intercorrelations is seen in table 2. The CASQ composite score correlated significantly with PAT93, PAT91, PAT90, and with task-orientation. The task-orientation and ego-orientation scores did not correlate significantly with mathematics achievement. Task-

orientation correlated with the five FMQ filler items concerned with attitudes toward teaching practices whereas the ego scores correlated with only one of these items. (see table 3).

Insert table 3 about here

Of particular note in table 2 is that the relation between the negative scale of the CASQ and mathematics achievement remained significant over the four year period, except in the case of the PAT92 data. Also a stepwise regression procedure applied to PAT93 scores revealed that the variance associated with the negative CASQ score was not enhanced by addition of the positive score into the analysis. Additional regression procedures indicated that variance on the negative CASQ scores associated with current achievement (PAT93) was not enhanced by adding prior achievement levels (PAT91 and PAT90) into the equation. The 1992 achievement data failed to correlate significantly with the CASQ scores.

To further check on the nature of the CASQ/PAT93 correlation we computed separate correlations for boys and girls, and also for the three age levels separately. In each case the coefficients remained around the value of 0.3.

Categorical assignment. Scores on the CASQ were used to define three subgroups with relation to the construct of explanatory style: optimistic, pessimistic, and balanced children. We defined optimists as children whose composite score fell within the top quartile, and pessimists as those whose score fell within the bottom quartile. Thus, the balanced group were those with composite scores between these two levels. The sex difference obtained on the CASQ meant that different cutoff points had to be used for boys and girls (see table 4).

Insert table 4 about here

Scores on the FMQ and PAT93 were then analyzed using 3x2 ANOVAs with optimism grouping and sex as independent variables. Significant effects were found on PAT93 ($F(2,92)=4.89, p<.05$), ego-orientation ($F(2,82)=8.7, p<.001$), attitude to teacher explanation ($F(2,81)=3.37, p<.05$), and attitude to teacher monitoring ($F(2,82)=4.12, p<.05$) (means depicted in table 5). The latter 3 analyses were then repeated using the PAT93 scores as covariates. In each case the F ratios actually increased slightly, indicating that the relationships were not dependent upon the finding that the more optimistic children tended also to be higher achievers in mathematics.

Insert table 5 about here

On the first set of ANOVAs the F ratio associated with task-orientation also achieved significance ($F(2,84) = 3.15, p < .05$). This level of significance was not maintained when we entered PAT93 into the analysis as a covariate.

DISCUSSION

The present analyses disclosed six major findings:

- (a) sex differences were found on the CASQ, on each of the three measures of explanatory style, with the girls evidencing a more optimistic pattern,
- (b) each of the three CASQ indices correlated with the current level of mathematics achievement, the largest such correlation being found between achievement and the composite score,
- (c) the negative score on the CASQ correlated with mathematics achievement data collected 2 and 3 years earlier in time,
- (d) children classified as optimists exhibited relatively favorable attitudes toward teacher behaviours of monitoring and verbal exposition, contrasted against children classified as

pessimists, these relationships being independent of actual ability levels within mathematics,

- (e) optimistic children evidenced higher levels of task-orientation on a questionnaire measure of motivational dispositions, relative to pessimistic children, and
- (f) contrasted against children we labeled as balanced in explanatory style, both optimistic and pessimistic children evidenced higher levels of ego-orientation within their motivational protocols.

The finding that explanatory style in students' questionnaire responses relates to performance on a standardized mathematics achievement test is consistent with the finding of Nolen-Hoeksema et al. (1986) who used the California Achievement Test. They reported a significant correlation between achievement and the CASQ composite score. In our data the coefficient was significant in the case of each of the three CASQ scores. This was surprising to us in that, within recent formulations of helplessness theory (e.g., Peterson, 1990; Seligman, 1990), the negative index is now viewed as the most important dimension of the explanatory style construct, especially in contexts involving achievement, evaluation, or the possibility of failure. In one salient project, for example, the negative, but not the positive, ASQ subtly had effectively predicted the actual professional success of insurance sales personnel (Seligman & Schulman, 1986).

To our awareness, the finding of a significant correlation between explanatory style for positive events and an achievement-type outcome has not been reported previously within the literature. It should be noted, however, that the effects associated with the negative tally were stronger and more robust, particularly with respect to the correlations with earlier achievement levels.

In conjunction with the CASQ vs. PAT intercorrelations it is apparent that the coefficients for the year 1992 (PAT92) simply were not significant. We are unable to account for this pattern, except to note that all the achievement testing was carried out by teachers within their own classes and for their own purposes. Variables associated with test administration were uncontrolled in our procedures, which suggests that the significant findings associated with the achievement scores are likely to be robust.

Although the present data provide evidence for asserting that explanatory style is associated with school mathematics achievement, it is important to stress that the pattern of causal relationships is quite unknown. Perhaps children of high ability levels learn to develop a more optimistic framework of thinking. Perhaps arriving at school with a relatively healthy explanatory style helps a child cope with school demands. Undoubtedly, other significant factors such as perceived self-efficacy, attentional focus, time engagement, and adult modelling play crucial mediating roles. In the present data we did find that optimistic children were more willing to endorse the task-involvement orientation, and to express more favorable attitudes toward teacher exposition and monitoring. However, the extent to which a child's score on an explanatory style instrument relates to actual indices of classroom behaviour is unknown. The central assumption of helplessness theory, that a specific pattern of attribution will induce passivity in the face of difficulty, has indeed received a very high level of support from laboratory, clinical, questionnaire, and other research, but perhaps surprisingly, has yet to be tested in actual classrooms under naturalistic conditions.

We found marked sex differences on the CASQ, with the boys evidencing a more negative pattern than the girls, the difference achieving significance on both positive and negative subscales. Sex differences were not commented upon in the earlier paper of Nolen-Hoeksema et al., but the same research team did report such differences in a subsequent project, a two-year longitudinal

study of depression and explanatory style in children from the third to fifth grades (Nolen-Hoeksema et al., 1991). They found, as did we, that boys were relatively lower on the negative scale. Sex differences were not significant on the positive scale in the Nolen-Hoeksema et al. (1991) project, except such differences were significant on those items taken from within the positive

scale concerned with family interactions. Hence, the available data support the notion that preadolescent boys possess a relatively more negative (i.e., depressogenic) explanatory style than girls of a similar age. But we also note that, overall, the study of sex differences in depression has yielded unclear findings, and that different factors appear to be salient at different points in development for the two sexes. A worthwhile synthesis of this complex research area is found in Nolen-Hoeksema (1990).

The finding that both optimists and pessimists endorsed ego-orientation on the FMQ was unanticipated. This finding would appear to be bound up with the fact that our optimists tended to be children with relatively high scores on the CASQ positive scale, and the pessimists tended to be those with high scores on the negative scale. That pessimism was found to coincide with ego-orientation we interpret in the following manner: Pessimistic beliefs tend to focus not only upon relatively fixed human traits and limitations in agency, but also upon implicit social comparisons. Simplistically, a pessimist either "has what it takes", or just "does not have it". Ego-orientation allows a pessimist to fix upon bolstering self-worth directly through striving to become better than others. Thus, life is a continual type of social competition where one has to keep "trying" in order to establish and maintain feelings of superiority and self-worth.

At the same time ego-orientation, at least in terms of its competitive motivational focus, can be adopted by optimistic children. Optimists expect to be able to beat others, especially by virtue of relatively unencumbered personal agency. Although optimists may not need to prove their self-worth via competition, such pursuits are never-the-less available simply as one possible source of reinforcement. This interpretation is consistent with the conclusion of Peterson and Bossio (1991, table 6.2) who noted that failure to compete (i.e., to enter the field) constitutes one of a set of prototypical helpless actions. Thus, in the case of the highly optimistic children, task-involvement and ego-involvement appear as dispositions that may naturally coexist, but in this case the pattern of psychological needs and motive structures is a far healthier one.

In sum, this project has further documented psychological advantages associated with optimistic explanatory style during childhood. Optimistic thinking relates to the child's desire to learn and to understand mathematics, and to holding positive attitudes toward certain teaching behaviors. Further, optimistic children in our sample scored at higher levels on a well-regarded standardized test of achievement in mathematics. Considerably more research needs to be undertaken to more fully investigate the cause-and-effect nature of these relationships, and future research in this area needs to pay especial attention to classroom behaviour and process variables. However, the case has

been established for considering explanatory style a highly significant individual difference variable intrinsically linked to children's academic success in school, as well as to their personality adjustment and susceptibility to serious psychopathology.

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Table 1

Feelings in Mathematics Questionnaire (FMQ)

Item stems:

Do you feel really pleased in maths when Factor loadings

Ego You know more than the others. .826
You do better than the other children. .777

You are the only one who can answer a question. .738
You finish before your friends. .712

	You score better on the test than the others	.648
	You can see the others making mistakes	.526
Task	You solve a problem by working hard.	.834
	You try your hardest.	.759
	You work hard all the time.	.704
	You find a new way to solve a problem.	.680
	You are making good progress in learning difficult things.	.672
	Something you figure out really makes sense.	.645
	The teacher says you are doing excellent work	.635
	Something you learn makes you want to find out more.	.618
	You get really busy with the work	.460

Note. The 5-point response scale for each item consisted of "Strong yes", "A bit yes", "I don't know", "A bit no", and "Strong no", scored from 5 to 1 respectively. The above items are of course intermixed within the questionnaire, along with filler items. Factor loadings are based on a varimax analysis. The FMQ is modelled after the MOS developed by Nicholls et al., 1990.

Table 2

Product-moment correlations for PAT mathematics and individual difference measures

Variable	1	2	3	4	5	6	7	8
1. PAT93								
2. PAT92		.72**						
(77)								
3. PAT91		.71**						
(53)		.73**						
(39)								
4. PAT90		.57**						
(54)		.76**						
(37)		.68**						
(38)								
5. CASQ Composite			.34**					
(130)			.09					

(67)	.25	
(51)	.30*	
(51)		
6. CASQ Positive		.20*
(130)	-.01	
(67)	.06	
(51)	.07	
(51)	n.a.	
7. CASQ Negative		-.30**
(130)	-.15	
(67)	-.29*	
(51)	-.35*	
(51)	n.a.	-.06
(130)		
8. Task- orientation		.15
(133)	-.01	
(71)	-.12	
(46)	.15	
(49)	.28**	
(118)	.27**	
(118)	-.13	
(118)		
9. Ego- orientation		-.14
(133)	-.07	
(71)	-.11	
(46)	.23	
(49)	.05	
(118)	.11	
(118)	.03	
(118)	.29**	
(133)		

Note. Figures in brackets represent n with PAT data from earlier years being available on only a subset of the sample. (n.a.= not applicable).

Two tailed probabilities, * $p < .05$ ** $p < .01$

Table 3

Product-moment correlations between motivational orientation and

attitudes to mathematics teaching behaviours

Attitude statement	Task-orientation	Ego-orientation
"The teacher explains things" (exposition)	.37**	.03
"The teacher shows you how to do things" (modelling)	.19*	.02
"The teacher gives you lots of help" (individual guidance)	.20*	.04
"The teacher looks at your work" (monitoring)	.42**	.17*
"The teacher says it time for a test" (evaluation)	.22**	.05

Note. N = 133. Each item was preceded by the common stem "Do you feel really pleased when". Responses were indexed on a 5-point scale from "strong yes" to strong no". Two tailed probabilities were used, * $p < .05$ ** $p < .01$.

Table 4

Categorical assignment on CASQ scores

	Pessimists (n=29)	Balanced (n=26)	Optimists (n=33)
Boys	-5 to 1 (18)	5 to 6 (12)	8 to 17 (14)
Girls	0 to 4 (11)	6 to 7 (14)	9 to 17 (19)

Note. The significant sex difference on the CASQ entailed different quartile cutoffs for boys and girls. Cutoff levels for the children labeled as balanced were then partially determined by the quartile cutoffs for the opposite sex, in order to prevent ambiguous designation. The number in brackets represents each cell frequency (i.e. n).

Table 5

Achievement and FMQ responses in optimistic and pessimistic children

Optimists		
(O)	Balanced	
(B)	Pessimists	
(P)	Means differences	
PAT93	0.384	
(1.13)	0.176	
(0.93)	-0.36	
(0.80)	0, B > P	
Attitude to teacher exposition		4.27
(0.87)	4.0	
(0.81)	3.55	
(1.4)	0 > P	
Attitude to teacher monitoring		3.91
(0.94)	3.37	
(1.3)	3.12	
(0.99)	0 > P	
Ego-orientation		24.78
(3.41)	19.81	
(6.26)	23.93	
(4.27)	0, P > B	
Task-orientation		40.45
(3.5)	38.44	
(4.7)	36.86	
(7.9)	0 > P	

Note. The above figures represent means, with standard deviations in brackets. The PAT data are expressed as standard scores. The two attitude measures were 5-point scales with 5 as the positive ceiling. The ego measure represents scores between 6 and 30. The task measure represents scores between 9 and 45. Means testing used Newman-Keuls procedures, $p < .05$ in all instances.

