The Relationship of Family Environments to Parent Motivation Strategies and Children's Self-Consciousness in the Math Classroom

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ABSTRACT

This paper looks at family environments from the perspective of both parents and children. Modified versions of Epstein and McPartland's (1977) Family Decision-Making Scale were administered to parents, upper elementary and junior high school children to assess their perceptions of the degree to which the child shares power and authority with parents and the degree to which the child participates in making decisions at home. Study 1 found support for the hypothesis that parent-child authority relationships are systematically related to the types of strategies which parents use to motivate their children in math. Parents from highly Conflicted or highly Authoritarian family environments relied more on Extrinsic motivation practices, while those from highly Child Self-Regulating family environments relied more on Intrinsic motivation practices. Parents' preference for certain motivation practices were mediated by their perceptions of their children's math-related attitudes. Study 2 found support for the hypothesis that parent-child authority relationships are systematically related to children's self-consciousness in the math classroom setting. Children from highly Authoritarian families reported greater self-consciousness in the math classroom whereas those from highly Child Self-Regulating families reported an opposite pattern. It is concluded that parent-child authority structures are systematically related to parental behaviors and children's self-assessments. Future research is needed to augment our understanding of the parent-child dynamics which contribute to these observed relationships.

There has been increasing interest in the relationship between home environments and adolescents' achievement-related attitudes and behaviors. Several aspects of the home environment have been explored. Adolescents reporting greater participation in family decision-making also report greater self-reliance, greater self-esteem, greater satisfaction with school and student-teacher relations, and more positive school adjustment (Epstein and McPartland, 1977). Junior high school students who report greater Involvement and Expressiveness in the home environment also have higher GPA's, higher achievement test scores, and are absent from school for fewer days (TDR Associates, 1981). Amongst 8th and 10th graders, open communication with family members is predictive of greater satisfaction with school and student-teacher relations (Isherwood and Hannah, 1981). While these studies have looked at the family environment of adolescents as perceived by students, this study looks at the home environment from the perspective of both parents and students. This paper is divided into two parts. Study 1 focuses on the relationship between parent perceived family environments and parent motivation strategies. Study 2 assesses the relationship between student perceived family environments and students' concerns with self-consciousness and self-focus in the math classroom setting.

METHODS

SAMPLE

During the Spring of 1983 we surveyed students in 14 classrooms in southeastern Michigan. These 14 classrooms were taken from one elementary school and three junior high schools, and included two 4th/5th split-grades, two 5th grades, nine 7th grades, and one 8th grade. Altogether 291 students (128 boys and 163 girls), 181 mothers, and 133 fathers participated in this study.

MEASURES

Students were administered questionnaires during classroom time. The student questionnaire included a broad array of questions about students' attitudes and beliefs about achievement in academic (primarily math), social, and physical domains. This questionnaire also included affective items assessing students' general level of self-esteem as well as students' self-consciousness in the math classroom. In addition students were asked about their family environment. Items in the student questionnaire were partialed into one of three forms, with some items common to all forms.

Parents were mailed questionnaires assessing a broad array of parent beliefs and attitudes about their child's achievement in academic (primarily math), social, and physical domains. Parents were asked about their family environment and the frequency with which they use various strategies in order to

motivate their child to do better in math. In addition, parents of junior high school students were asked about their child's adjustment to junior high school. Items in the parent questionnaire were partialed into one of two forms, with some items common to both forms. Because no effort was made to ensure that within a family parents would answer items parallel to those which their child answered, the number of families in which parents and children received the same pool of items is small; however, mothers and fathers within a family received the same pool of items. Our analyses will focus on parents' perceptions and children's perceptions separately, but comparisons will be made between mothers' and fathers' perceptions of their children. Furthermore, our analyses will include all mothers, fathers, and/or students who answered the particular set of items under investigation. Because some items appeared on one form while others were on all forms, the number of parents and students included in an analysis will differ across analyses.

STUDY 1

FAMILY ENVIRONMENTS AND PARENT MOTIVATION STRATEGIES

Studies have shown that adolescents' family environments contribute to their achievement expectations. Adolescents who report democratic authority relationships with their parents are more likely than those reporting autocratic relationships to expect to go to college (Bowerman and Elder, 1964; Rehberg, Sinclair, and Schafer, 1970). Thus parents who have democratic authority relationships with their child seem to facilitate achievement, as measured by educational expectations. Other studies have shown that parents play an important role in their children's attitudes towards math achievement. Junior high school students rate their parents as the most influential people in their course enrollment decisions (Eccles et al., 1983). They also rank parents second only to usefulness of math in influencing their decisions to take more math (Armstrong, 1980). While children have reported that parents play an important role in their achievement-related decisions, very little is known about the actual strategies which parents use in order to transmit their influence. Thus Study 1 addresses two questions: (1) what strategies do parents use in order to motivate their children to improve their math performance, and (2) do parents in different family environments use different strategies to motivate their children in math.

PARENT VARIABLES

Parent perceptions of the home environment. To assess parent perceptions of the home environment, items parallel to those in the student version of Epstein and McPartland's (1977) Family Decision-Making Scale were created. This scale contains 12 items measuring the degree to which the child shares power and authority with parents and the degree to which the child participates in making decisions at home. Wording for these

items along with their response options are listed in Table 1. Factor analysis[1] of these 12 items revealed a 3-factor model which accounted for 27.2% of the variance among these items. An oblique rotation of these 3 factors yielded the most interpretable solution. An inspection of the items which load highly on the first factor suggests that this factor reflects a family environment characterized by significant parent-child conflicts. Parents who score high on this factor seem worried and mistrustful; although they perceive their child as being dependent on them and taking little part in making decisions, they also feel that s/he is argumentative about their rules and decisions for him/her. This factor seems to reflect a Conflicted family environment. Parents who score high on the second factor see themselves as strict, want their child to follow their directions even if s/he disagrees with their reasons, and do not like their child to disagree with them in front of friends. Although they tend to think that their child is mature, they also tend to make decisions for him/her by telling him/her what to do. This factor seems to reflect a family environment characterized by high parent control, and we have labeled this factor the Authoritarian family factor. Finally, parents who score high on the third factor report that their child does not need their permission to do most things though at times s/he does not know why s/he is supposed to do what they tell him/her, that their child is mature for his/her age, and that their child tends not to count on them to solve his/her problems. This factor seems to reflect a family environment where the child has some opportunities for self-direction, and we have labeled this factor the Child Self-Regulating family factor. Weighed factor scores were computed for the Conflicted, Authoritarian, and Child Self-Regulating family factors. Families high in conflict tend to have higher parent control (r = .36, $p \leq .01$) and fewer opportunities for child self-direction (r = -.32, $p \leq .01$). However, parents' perceptions of the amount of parent control in the family environment are not systematically related to their perceptions of the amount of opportunities for child self-direction in the family environment (r = .09).

Parent perceptions of their child's adjustment. Parents' of junior high school students were asked about their child's adjustment to junior high school. These parents were asked how well or poorly their child had adjusted, and whether their child's attitudes towards school in general and math in particular had become better or worse. We asked whether their child had become more or less concerned about his/her grades in general, math grades in particular, math ability, and sports ability. In addition we asked whether their child had become more or less concerned about how many friends s/he had, and whether s/he had become more or less popular since s/he entered

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[1]All factor analyses reported in Study 1 and Study 2 use a principal components solution and Scree extraction criterion. All factor scores are computed from standardized data.

junior high school. All items were rated on 7-point Likert-type scales appropriately anchored with positive and negative descriptors at the endpoints.

Parent motivation strategies. Parents were asked about the frequency with which they used each of 13 strategies to motivate their child to do better in math. Each of these strategies was rated on a scale from 1 (never) to 4 (often). These strategies were developed from pilot interviews with junior high school parents who were asked what strategies they used in order to encourage their child to do better in math, and what they said or did when their child complained that math was too hard. In the present study three of these strategies -- comparing the child's math ability to that of others, physical punishment, and ignoring the problem -- were dropped from further analyses because virtually all parents reported that they never used them. Factor analysis of the remaining 10 items revealed a 2-factor model which explained 26.7% of the variance amongst these items. An oblique rotation of these 2 factors yielded the most interpretable solution (Table 2). Parents who score high on the first factor tend to take away privileges, offer to give rewards, tell the child that s/he should be ashamed of his/her performance, get help from a tutor or a teacher, and tell their child to try harder. They are less likely to provide home activities which use math, or buy math books or games for their child. Because most items which load highly on this factor seem to reflect parents' use of power assertion and rewards for compliance, this factor seems to tap Extrinsic Methods of Motivation. In contrast parents who score high on the second factor tend to provide home activities which use math, buy math books or games for the child, tell the child that they have confidence in his/her math ability, discuss the usefulness of math with their child, and help the child with math difficulties. They are less likely to take away privileges and tell the child that s/he should be ashamed of his/her performance. Because most items which load high on this factor seem to reflect parents' use of reasoning to appeal to the child's ability or interest in math, this factor seems to tap Intrinsic Methods of Motivation. Weighed factor scores were computed for the Extrinsic and Intrinsic Motivation factors. There was a negative correlation between Extrinsic and Intrinsic Motivation practices ($r = -.74$, $p \leq .01$); thus parents tend to use one approach or the other, rather than both.

RESULTS AND DISCUSSION

PARENTS' PERCEPTIONS OF THE FAMILY ENVIRONMENT

We begin our analyses by assessing the independent effects of parent sex, child sex, and child grade level on parent perceptions of Conflicted, Authoritarian, and Child Self-Regulating family environments.

Parent Sex Effects. Pair-wise t-tests were performed comparing

mothers' and fathers' perceptions of the family environment. Mothers and fathers did not differ in the extent to which they perceived their home environments as Conflicted or Authoritarian. In other words mothers and fathers generally agreed on the amount of conflict between themselves and their child, and on the extent of parent control in their home environments. However, parent sex did have an important impact on parents' perceptions of the extent to which their home environment was Child Self-Regulating. Fathers reported that they offered more opportunities for child self-direction than did mothers (fathers' mean = .41, mothers' mean = -.31, $t(56) = 3.57$, $p \leq .01$). The variance for fathers on this dimension, however, was significantly greater than that for mothers (fathers' variance = 2.47, mothers' variance = 1.46, $F(64,83) = 1.69$, $p \leq .05$). Thus there seemed to be more variability amongst fathers in the extent to which they provided their child with opportunities for self-direction. In an attempt to find out the nature of the self-direction which fathers seem to provide, we looked more closely at the individual items which loaded highly on this factor. This inspection revealed that fathers were more likely than mothers to report that their child did not need their permission to do most things (mothers' mean = 1.70, fathers' mean = 2.25, $t(60) = 5.37$, $p \leq .0001$) and that their child did not know why s/he was supposed to do what s/he had been told to do (mothers' mean = 1.36, fathers' mean = 1.67, $t(60) = 3.18$, $p \leq .01$). Thus fathers' reports that they offer more opportunities for child self-direction may reflect that they are less involved in the child management tasks of parenting.

Child Sex Effects. Child sex had a moderate but nonsignificant impact on parents' perceptions of two dimensions of family environments, Conflicted and Child Self-Regulating. Parents of girls saw their family environments as less Conflicted than parents of boys (parents of boys' mean = .26, parents of girls' mean = -.21, $t(147) = 1.68$, $p \leq .08$). Parents of girls also reported that they provided more Self-Regulating family environments for their child than did parents of boys (parents of boys' mean = -.24, parents of girls' mean= .19, $t(147) = 1.86$, $p \leq .06$). These trends are noteworthy in light of Hill and Lynch's (1983) hypothesis that parents respond to early adolescents, especially girls, with an intensification of gender-related role expectations. These authors suggest that parents may encourage compliant behavior from their adolescent daughters by increasing chaperonage, increasing vigilance, and lessening permissiveness. Yet trends in our data suggest that parents are providing more opportunities for child self-determination to their daughters rather than to their sons.

Grade Level Effects. Whether the child was in elementary school or junior high school did not have an impact on parents' perceptions of the family environment. Because there is abundant literature suggesting that early adolescence is a turbulent time of a child's development, we went back to the original 12 items which comprised our family environment measure, and looked at the impact of child grade level on parents' perceptions of each of

these items. Child grade level was related to parents' perceptions on only two of the original 12 items. Compared to parents of elementary school students, parents of junior high school students reported that they were more displeased when their child disagreed with them in front of friends (jhs parents' mean = 2.60, elem parents' mean = 2.26, $t(154) = 2.21$, $p \leq .05$), but also felt that they were less strict than parents of elementary school students (jhs parents' mean = 4.53, elem parents' mean = 5.04, $t(158) = 2.72$, $p \leq .01$). There was also a trend that parents of junior high school children reported more arguments with their child about their rules and decisions for them (jhs parents' mean = 2.24, elem parents' mean = 2.02, $t(157) = 2.05$, $p \leq .06$), but parents of junior high school children showed more variability on this item than did parents of elementary school children (jhs parents' variance = .49, elem parents' variance = .21, $F(105,52) = 2.30$, $p \leq .001$). In short there was only weak evidence that grade level had an impact on parents' perceptions of the family environment. In general parents of elementary school students and parents of junior high school students did not differ on the amount of conflict, parent control, or child self-direction which they perceived in their family environments. However, the finding that junior high school parents report greater displeasure when their child disagrees with them, yet at the same time feel that they are less strict suggests that although they do not like their child to contradict them, they do not respond to their child's attempts at self-assertion and individuation by imposing greater parental control. The trend that there is greater variability among junior high school parents in their frequency of parent-child arguments suggests that future research needs to identify those coping strategies which mitigate parent-child conflict in some families and those which exacerbate such conflict in others.

Parents' Perceptions of their Children's Adjustment to Junior High School

Since studies have shown a positive relationship between various aspects of the home environment and children's school adjustment, we looked at the relationship between family environments and parents' reports of their children's adjustment to junior high school (Table 3). We found that parents from highly Conflicted family environments reported that their child was adjusting less well to junior high school, that his/her attitudes towards school as well as towards math had become worse, and that s/he had become less concerned about grades in general, math grades, and math ability. Parents from highly Self-Regulating family environments, on the other hand, reported that their child's attitudes towards school had improved, that their child had become more popular, and that s/he was more concerned about math ability though less concerned about sports ability. Thus while were no differences between parents of adolescents and parents of younger children in their perceptions of the family environment, particular family environments were related to parents' reports of their children's adjustment to

junior high school. While we cannot make causal inferences from our cross-sectional sample, both of the following dynamics seem plausible: (1) particular family environments may facilitate or frustrate children's school adjustment, and (2) children's satisfaction or dissatisfaction with school may affect parent-child relationships.

Parents' Methods of Motivation

While students report that parents' opinions are an important influence in their decisions to persist in math (Armstrong, 1980; Lantz and Smith, 1981), very little is known about the strategies which parents use to motivate their children in math. An inspection of the means for our parent motivation strategies indicated that the 5 most frequently used methods were: telling the child that they have confidence in his/her math ability (M = 3.48, SD = .72), telling the child to try harder (M = 3.11, SD = .81), discussing the future usefulness of math (M = 3.05, SD = .93), giving the child personal help (M = 2.93, SD = .85), and buying math books or games (M = 2.72, SD = .89). The five least frequently used strategies were: providing home activities that use math (M = 2.48, SD = .99), offering to give rewards (M = 2.31, SD = 1.04), taking away privileges (M = 1.93, SD = .98), telling the child the s/he should be ashamed of his/her performance (M = 1.47, SD = .78), and getting additional help (M = 1.47, SD = .88). In light of studies which have shown that self-confidence in math abilities and math value are good predictors of children's math course-taking (Eccles et al, 1983; Lantz and Smith, 1981), it is noteworthy that parents most prefer strategies which support children's self-concept of math ability and impress on children the future usefulness of math. Furthermore, parents' exhortations to apply greater effort may convey to those children with little confidence in their math abilities that successful math performance is attainable provided they work hard enough.

To test whether different family environments were related to specific parent motivation practices, we correlated each of our three dimensions of parent perceived family environments with the frequency with which parents used various strategies to motivate their children in math (Table 4). Parents from highly Conflicted family environments were more likely to take away privileges, offer to give rewards, tell the child the s/he should be ashamed of his/her performance, tell the child to try harder. They were less likely to tell the child that they have confidence in his ability, and provide home activities that use math. In general parents from highly Conflicted family environments were more likely to use Extrinsic Methods and less likely to use Intrinsic Methods to motivate their child to do better in math. Parents from highly Authoritarian family environments were more likely to take away privileges, and tell the child s/he should be ashamed of his/her performance. They were also less likely to provide home activities that use math. In general, like parents from highly Conflicted family environments, parents from highly

Authoritarian family environments were more likely to use Extrinsic Methods and less likely to use Intrinsic Methods to motivate their children to do better in math. Finally, parents from highly Self-Regulating family environments were less likely to take away privileges and tell their child to try harder. They were more likely to buy math books or games, and provide home activities that use math. Thus unlike parents from either highly Conflicted or highly Authoritarian family environments, parents from highly Self-Regulating family environments were less likely to use Extrinsic Methods and more likely to use Intrinsic Methods to motivate their children to do better in math. In short parents from different family environments prefer different strategies to motivate their children in math. Parents from family environments characterized by high parent-child conflict or high parent control rely more on power assertion, while those from family environments characterized by opportunities for child self-determination rely more on use of reasoning.

The relationship between family environments and parent motivation practices may be mediated by parents' perceptions of their children's attitudes towards math and math grades. We were able to test this hypothesis with our sample of junior high school parents. We reason that parents from Conflicted or Authoritarian family environments may prefer Extrinsic Methods because they perceive that their children's attitudes toward math and math grades have become worse. Parents who have children with poor attitudes toward math may be more successful with motivation methods that use power assertion and rewards for compliance. Conversely, parents from Self-Regulating family environments may prefer Intrinsic Methods because they perceive that their children's attitudes toward math and math grades have improved. Parents who have children with positive attitudes toward math may be more successful using motivation methods which capitalize on their children's ability or interest in math. Correlations between parents motivation practices and parent perceptions of their children's adjustment to junior high school reveal that such a pattern does indeed prevail. Parents who used Extrinsic Methods of motivation were more likely to report that their child was adjusting poorly ($\underline{r}$ = -.23, $\underline{p} \leq .01$), that his/her attitudes toward math had become worse ($\underline{r}$ = -.16, $\underline{p} \leq .05$), that s/he had become less concerned about grades in general ($\underline{r}$ = -.17, $\underline{p} \leq .05$), and math grades in particular ($\underline{r}$ = -.16, $\underline{p} \leq .05$). On the other hand, parents who used Intrinsic Methods of motivation were more likely to report that their child was adjusting well ($\underline{r}$ = .13, $\underline{p}$=.07), that s/he had become more concerned about grades in general ($\underline{r}$ = .23, $\underline{p} \leq .001$), math grades in particular ($\underline{r}$ = .25, $\underline{p} \leq .001$), and about his/her math ability ($\underline{r}$ = .17, $\underline{p} \leq .05$).

It is clear that family environments relate to parental assessments of their children's adjustment to junior high school and to parental motivation techniques. But do family environments relate to adolescents' self-perceptions and self-evaluations? Study 2 addresses this question.

STUDY 2

FAMILY ENVIRONMENTS AND STUDENT SELF-CONSCIOUSNESS

Studies have suggested a link between family environments and children's self-related affects. For example, studies have shown that parent-child authority relationships affect children's self-concept and self-esteem. Coopersmith (1967) found that children with high self-esteem have parents who provide clearly defined and consistently enforced limits on children's behaviors, and at the same time respect individual action within those limits. Similarly, Baumrind (1968) writes that children who are independent and self-controlled tend to have parents who provide a positive sense of direction and control when necessary. Streitmatter and Jones (1982) also found that boys with higher self-esteem come from home environments which are more egalitarian and less autocratic.

While there has been much research on the development of children's self-esteem, children's self-consciousness has been a relatively unexplored dimension of the self-concept. Yet teachers have noted that students who are self-conscious tend to perform worse in school because they avoid participating in class and seeking help from teachers or peers. By self-consciousness, we refer to a heightened awareness of the self, or what Duval and Wicklund (1972) have called "objective self-awareness". One is conscious of the self as well as of the other looking at the self, and this divided focus of attention has been shown to debilitate performance (see Wicklund, 1975, for review). Self-consciousness may refer to a heightened attentional focus on one's behaviors or on one's internal thoughts and feelings (Fenigstein, Scheier, and Buss, 1975). Self-consciousness has been implicated in embarrassment (Modigliani, 1968), shyness (Pilkonis, 1977), communication apprehension (see Friedman, 1980, for review), and social anxiety (Buss, 1980). Self-consciousness may be precipitated by events which discredit one's social presentation (Goffman, 1956; Modigliani, 1968). It may also be precipitated by excessive compliments, or what Buss (1980) calls "overpraise". A key element of self-consciousness then is a subjective sense of conspicuousness; for whatever reason, negative or positive, a public spotlight is shining on a private event, and this self-focused attention is assumed to be aversive for some individuals.

There is some evidence that adolescents are more self-conscious than younger children, and girls more so than boys. In a study comparing 9th graders and 4th graders, adolescents exhibited relatively more concerns with the self than the external world, and in particular exhibited more negative self-concerns (Kissel, 1975). Another study comparing 4th, 6th, 8th, and 12th graders found that 8th graders were the most self-conscious, with girls consistently more so than boys (Elkind and Bowen, 1979). Similarly, shyness research involving 4th though 8th graders found that 42% of 4th through 6th graders reported

that they were shy, whereas 54% of junior high school students reported that they were shy, again with girls more so than boys (Zimbardo, 1977). Furthermore, shy junior high school girls in the Zimbardo study rated themselves as less intelligent than did nonshy girls or than did boys. Finally, in their study of 8- to 15-year-olds, Rosenberg and Simmons (1975) found that girls reported somewhat lower self-esteem than boys, but reported markedly higher self-consciousness. Although both boys and girls in their study showed an increase in self-consciousness in early adolescence, this increase was much sharper among girls. By late adolescence boys showed a decline in self-consciousness, but girls' self-consciousness continued to rise. These investigators attributed this sharp rise in girls' self-consciousness to an increased "people-orientedness" among girls during early adolescence. Compared to boys, adolescent girls in their study reported that they were more worried about what others thought about them, were more fearful of displeasing others, and were more vulnerable to others' criticism and disapproval. Further support for the relationship between self-consciousness and concerns about others' evaluations of the self has been offered by Adams and Jones (1981) who found that self-conscious adolescents rated themselves higher on a scale of social desirability and performed better on a task of social sensitivity.

While studies have related family environments to children's self-esteem, Study 2 explores the relationship between family environments and children's self-consciousness in the math classroom setting. As studies have shown that children from more democratic or egalitarian family environments tend to have higher self-esteem, we expect that children from such environments will also rate themselves as less self-conscious than those from more authoritarian or autocratic family environments. We reason that family environments characterized by high parent control will foster an attitude of self-evaluation in comparison to others' standards. On the other hand, family environments which offer the child opportunities for self-direction will foster a sense of personal agency and autonomy. To the extent that children are attuned to how they measure up to rules and decisions which have been made by others, they will develop a more self-focused orientation. To the extent that children are encouraged to make their own decisions, their attentional focus will be directed more towards the task at hand, and away from the self's compliance with external authority.

STUDENT VARIABLES

Student perceptions of the home environment. Students' perceptions of the family environment were measured by a modified version of Epstein and McPartland's (1977) Family Decision-Making Scale, reported to have an internal consistency of .71. While Epstein and McPartland asked these items as dichotomous items, we have chosen to ask them as continuous items in order to capture a range of parent-child authority relationships. Wording for these

items along with their response options are listed in Table 5. Factor analysis revealed a 3-factor model which accounted for 30.6% of the variance amongst these items. An oblique rotation of these 3 factors yielded the most interpretable solution. Students who score high on the first factor report that their parents want them to follow their directions even if the child disagrees with their reasons, that they have a lot of fights with their parents about their rules and decisions for them, that their parents tend to treat them like a little kid, and that they sometimes do not know why they are supposed to do what their parents tell them to do. They also feel that their parents do not trust them to do what they expect without checking up on them. This factor seems to reflect a family environment characterized by high parent control. We have labeled this factor the Authoritarian family factor. Students who score high on the second factor report that their parents are not strict, that they take part in making family decisions that affect them, that their parents tend to let them arrive at their own decisions, and that their parents do not insist that they follow their directions if they disagree with their parents' reasons. This factor seems to reflect a family environment where students have input in making family and personal decisions. We have labeled this factor the Participatory family factor. Finally, students who score high on the third factor report that their parents are not strict, and that their parents trust them to do what they expect without checking up on them. They also report that they do not count on their parents to solve their problems, that their parents do not insist that they follow their directions if they disagree with their reasons, that they generally know why they are supposed to do what their parents tell them to do, and that their parents are rarely upset if they disagree with them when friends are around. This factor seems to reflect a family environment where students have some opportunities for self-direction. We have labeled this factor the Child Self-Regulating family factor. Weighed factor scores were computed for the Authoritarian, Participatory, and Child Self-Regulating There is a negative relationship between Authoritarian family environments and both Participatory (r = -.32, $p \leq .01$) and Child Self-Regulating family environments (r = -.61, $p \leq .01$). Thus families which have high parent control tend to offer fewer opportunities for child participation in family decision-making and fewer opportunities for child self-direction. There is a positive relationship between Participatory and Self-Regulating family environments (r = .50, $p \leq .01$). Thus families which offer opportunities for child participation in family decision-making also offer opportunities for child self-direction.

General self-esteem. Students' general self-esteem is measured by 7 items developed by Harter (see Harter, 1982, for details). These items ask students about their general self-satisfaction and perceptions of their general self-worth. Factor analysis of these 7 items revealed one common factor which explained 29.9% of the variance amongst these items (Table 6). Students who score

high on this factor report that they wish they were different, that they wish they acted differently, that they are not very sure of themselves, and that they tend to wonder whether or not they are doing the right thing. They also report that they are not very happy with the way they do a lot of things, that they tend to think that maybe they are not a very good person, and that there are things that they would like to change about themselves if they could. Since high scores on this factor seem to reflect low self-esteem, we labeled this factor Low Self-Esteem. Child sex had a moderate but nonsignificant impact on students' self-esteem. Girls generally tended to have lower self-esteem than boys (girls' mean = .15, boys' mean = -.22, $t(76) = 1.87$, $p \leq .06$). Child grade level on the other hand did have a significant impact on student's self-esteem. Junior high school students reported lower self-esteem than elementary school students (jhs students' mean = .12, elem students' mean = -.29, $t(76) = 1.96$, $p \leq .05$). This finding is consistent with other studies which have found a drop in children's self-evaluations as they move from middle childhood to early adolescence (e.g., Simmons, Rosenberg, and Rosenberg, 1973).

Self-consciousness in the math classroom. Self-consciousness in the math classroom is measured by 5 items developed by Flanagan (1984). These items tap students' concerns about others' scrutiny and appraisal of their behaviors in the math classroom. Each item was rated on a scale from 1 (not at all true of me) to 4 (very true of me). Factor analysis of these 5 items revealed one common factor which explained 39.1% of the variance amongst these items (Table 7). Students who score high on this factor report that they worry what other kids in the class think about them, that they feel embarrassed when the teacher corrects their answer in front of the other students, that they do worse on a math problem when other students are watching them, that they do not like the teacher to call on them even when they know the right answer, and that they tend not to want other kids to know how they've done on a math test even if they have done well. Although the concerns expressed in these items might be applicable in any classroom setting, because we asked specifically about math classroom settings, we labeled this factor Math Self-Consciousness. Contrary to findings from other studies about global self-consciousness, neither child sex nor child grade level was a significant predictor of Math Self-Consciousness. However, Math Self-Consciousness was significantly correlated with Low Self-Esteem ($r = .28$, $p \leq .01$). Thus students who were self-conscious in the math classroom also reported greater self-dissatisfaction.

RESULTS AND DISCUSSION

STUDENTS' PERCEPTIONS OF THE FAMILY ENVIRONMENT

As with parents' perceptions of the family environment, we begin our analyses of students' perceptions by looking at the independent effects of child sex and child grade level on

students' perceptions of the family environment.

Child Sex Effects. Consistent with the pattern of results for parent perceptions of the family environment, there was a weak trend that girls felt that their family environments offered more opportunities for participation in family decision-making (girls' mean = .19, boys' mean =-.28, $t(103) = 1.70$, $p \leq .10$) and for self-direction than did boys (girls' mean = .24, boys' mean = -.33, $t(103) = 1.73$, $p \leq .10$). Again, these trends suggest that parents are not responding to their daughters' emerging adolescence with greater restrictiveness (Hill and Lynch, 1983).

Grade Level Effects. Grade level had a significant impact on students' perceptions of their family environments. Junior high school students reported that their family environments were more Participatory (jhs students' mean = .48, elem students' mean = -.53, $t(103) = 3.86$, $p \leq .001$) and more Self-Regulating (jhs students' mean = .33, elem students' mean = -.36, $t(103) = 2.10$, $p \leq .05$) than elementary school students. When we looked at the individual items that comprise our family environment measure, we found that elementary school students were more likely to report that their parents want them to follow their directions even if they disagree with their reasons (elem students' mean = .3.11, jhs students' mean = 2.74, $t(115) = 2.01$, $p \leq .05$), and that their parents do not like them to disagree with them in front of friends (elem students' mean = 2.60, jhs students' mean = 2.15, $t(113) = 2.31$, $p \leq .05$). In contrast, junior high school students were more likely to report that their parents allow them to make decisions (elem students' mean = 2.06, jhs students' mean = 2.67, $t(107) = 3.06$, $p \leq .01$). However, consistent with the trends found in parent perceptions of the family environment, junior high school students report that they have more fights with parents about their rules and decisions for them (elem students' mean = 1.63, jhs students' mean = 2.19, $t(112) = 3.76$, $p \leq .001$), though there was significantly greater variability amongst junior high school students in the frequency of parent-child arguments which they reported (elem students' variance = .46, jhs students' variance = .82, $F(57,55) = 1.80$, $p \leq .01$). The finding that junior high school students generally report greater opportunities for participation in family decision-making and for self-determination support the notion that as the child matures parents tend to accommodate to the child's increasing need for self-assertion (Newman and Murray, 1983). However, as with parents, the finding that there is great variability among junior high school students in the extent to which they report parent-child arguments suggests that more attention needs to be directed to those family dynamics which make adolescence a turbulent period for some families but not others (Montemayor, 1983).

Students' Self-Consciousness

Students' perceptions of their family environment were highly related to their self-consciousness in the math classroom (Table 8). Students from highly Authoritarian family

environments were more concerned with others' scrutiny and appraisal of their behaviors. They reported that they did not like teachers to call on them even when they knew the right answer, that they worried about what other kids thought when they gave the wrong answer, that they felt embarrassed when the teacher corrected their answer in front of other students, and that they did worse on a math problem when a lot of students were watching them. In general they reported greater overall self-consciousness in the math classroom. On the other hand, students from highly Self-Regulating family environments told us that they did not mind teachers calling on them, that they were not very concerned about what other kids thought when they gave a wrong answer, that they were not very embarrassed when the teacher corrected their answer in front of the class, and that they were not very affected when other students watched them while they were doing a math problem. In general they reported less overall math self-consciousness. Participatory family environments were not systematically related to children's self-consciousness in the math classroom. This pattern of findings generally held for both boys and girls, and for elementary school students. There was a slightly different pattern of findings for junior high school students. Like elementary school students, junior high school students from highly Self-Regulating family environments were generally less self-conscious in the math classroom. However, there was no systematic linear relationship between the amount of parent control which they perceived in their home environments and their math self-consciousness. On the other hand, junior high school students from highly Participatory family environments reported that they were generally less self-conscious in the math classroom. These students said that they were less embarrassed when the teacher corrected their answers in front of other students, and that they were less affected when other students watched them while they were doing a math problem.

GENERAL SUMMARY AND CONCLUSIONS

Studies 1 and 2 looked at family environments as perceived by parents and students. The independent effects of parent sex, child sex, and child grade level on parents' and children's perceptions of parent-child authority relations were assessed.

In general mothers and fathers did not differ in the amount of conflict and parent control which they perceived in the home environment. But fathers reported that they provided their child with more opportunities for self-direction than did mothers.

Child sex had an impact on parents' perceptions of the family environment. Parents of girls felt that their family environment was less conflicted and offered more opportunities for child self-direction than did parents of boys. Similarly, girls tended to feel that their family environments offered more opportunities for participation in making family and personal decisions than did boys.

Because studies have indicated that adolescence is a turbulent time of a child's development (see Montemayor, 1983, for review), we might expect parents of junior high school students to respond defensively to their child's demands for greater autonomy, and thus report greater conflict, greater parent control, and fewer opportunities for child self-direction. However, we found no evidence that child grade level was related to parents' perceptions of the family environment. Furthermore, rather than greater parent control, junior high school students reported that they had more opportunities for participation in family decision-making and for self-direction than did elementary school students. While parents of junior high school students did not differ from those of elementary school students in the amount of conflict, parent control, or child self-direction which they perceived in their family environments, parents from home environments characterized by high parent-child conflict did report that their child had greater difficulties in adjusting to junior high school, while those from home environments characterized by opportunities for child self-direction reported that their child had fewer such problems.

Several conclusions about the family environments of preadolescents and early adolescents are suggested by these findings. First, although fathers and mothers may be equally strict with their child and experience similar levels of conflict with him/her, fathers may nevertheless be less involved in the actual tasks of supervising the child's day-to-day activities. Second, parents seem to trust their daughters more than they do their sons, and offer their daughters more opportunities for independent decision-making. Third, there was no evidence that the home environments of early adolescents were more conflicted, more authoritarian, or less democratic than those of preadolescents. Indeed parents of early adolescents saw themselves as less strict than parents of preadolescents, and early adolescents thought that their parents offered them more opportunities for independent and autonomous behavior. Finally, the finding that certain family environments are predictive of junior high school adjustment supports other studies which find a relationship between home factors and child's school satisfaction (Epstein and McPartland, 1977; Isherwood and Hannah, 1981; TDR Associates, 1981).

In addition to exploring parent perceptions of the home environment, Study 1 also addressed 2 questions: (1) what strategies do parents use in order to motivate their child in math, and (2) do parents in different family environments use different strategies to motivate their child in math. In answer to our first question, we found that parents generally prefer to address their interventions to the child's self-concept of math ability, his/her expenditure of effort, or his/her valuing of math. Self-concept of math ability and math value have both been shown to be good predictors of children's continuing motivation in math (Eccles et al., 1983; Lantz and Smith, 1981). Furthermore, attributing poor performance to an unstable and

controllable factor such as insufficient effort leads children to believe that they can improve their math performance in the future (Weiner et al., 1971).

In answer to our second question, we found that parents from home environments which were highly conflicted or highly authoritarian were more likely to use motivation practices involving power assertion and rewards for compliance, while those from home environments which were highly democratic were more likely to use motivation strategies involving appeal to the child's ability or interest in math. Furthermore it was suggested that the relationship between family environments and parents' preference for Extrinsic or Intrinsic Methods of motivation was mediated by parents' perceptions of their children's math-related attitudes. Parents who preferred Extrinsic Methods were more likely to report that their child's math attitudes had become worse, while those who preferred Intrinsic Methods were more likely to report that their child's math attitudes had improved.

While Study 1 found that family environments were related to parental assessments of their children's junior high school adjustment and parental motivation practices, Study 2 investigated the relationship between home environments and adolescents' self-consciousness in the math classroom. Students from highly Authoritarian families reported that they were more concerned with others' scrutiny and appraisal of their behaviors in the math classroom. Those from environments with opportunities for child self-determination reported that they were less concerned with others' scrutiny and appraisal of their behaviors in the math classroom. These findings suggest that treating the child as a separate autonomous individual who is capable of independent decision-making and worthy of trust has a mitigating effect on children's concerns with other's evaluative judgments. Inclusion of the child in making family decisions had a mitigating effect on math self-consciousness especially for junior high school students.

Two interpretations of these findings are plausible. First, family environments characterized by high parent control may intensify self-consciousness by focussing attention on the self's conformity to external rules and standards. In contrast family environments which offer the child opportunities for independent and autonomous behavior and convey to him/her that s/he is worthy of trust may focus attention on the task of independent decision-making, and away from the self's compliance with decisions made by others. An alternative interpretation of these findings is that highly self-conscious children may feel less anxious when there is more structure; thus parents of such children may exert greater control because they are responding to their children's demands for more direction, whether explicit or implicit.

Early adolescence is generally understood as a time when children begin the transition from dependence on parents to a

definition of themselves as autonomous individuals. It is in the familiar context of the family that the young adolescent is likely to "test the waters" of self-definition by stating opinions, making decisions, and, in general, establishing his/her own personal style. The way in which the family system responds to the child's attempts at self-assertion will influence both the process of establishing an independent identity and the satisfaction which the child feels with that evolving identity. These data suggest that when families encourage children's self-determination in decision-making, children are less conscious of themselves as an object of others' evaluation.

It remains for future longitudinal investigations to determine the causal direction of parent-child dynamics which underlie these observed patterns. Future research should be aimed at understanding both (1) the impact of family environments on children's attempts at individuation and self-definition during this developmental period, and (2) the impact of children's emerging needs for separation and independence on existing parent-child relationships. While some conflict is to be expected whenever there are changes that threaten the equilibrium of a family system, adolescence is a more tumultuous developmental period for some families than others. Thus future research should also be aimed at identifying those coping strategies which mitigate and those which exacerbate family stress and conflict during adolescence.

Finally insofar as one's self-feelings affect one's behaviors, future research should also be aimed at identifying those intraindividual and environmental antecedents of low self-esteem and high self-consciousness. The interaction between such antecedents may be a particularly critical issue during adolescence, for individuals already high in dispositional self-consciousness may be especially vulnerable to contextual factors (e.g. classroom processes, cross-sex friendships) which enhance the salience of the self.

The family's response to the young adolescent's initiatives towards autonomy is critical in defining the path which the child's orientation towards his/her future will take. As Newman and Murray (1983) indicate, the choices which today's adolescents will face as adults are unparalleled in history. An understanding of the family dynamics which enable the child to take hold of the direction of her/his life should, therefore, be a research imperative.

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Table 1

Factor Loadings for **Parent Perceptions of Family Environments**

Item	Factor I Conflicted	Factor II Authoritarian	Factor III Child Self-Regulating
I worry that my child is up to something that I won't like[a]	.45	.08	.12
I trust my child to do what I expect without checking up on her/him[a]	-.36	.21	.22
How frequently does your child take part in making decisions that concern her/him?[c]	-.86	-.21	.12
My child argues with me about many of my rules and decisions for her/him[a]	.62	.29	-.24
My child counts on me to solve many of her/his problems[a]	.37	.26	-.48
As a parent of this child, how strict would you say you are?[d]	.22	.72	.27
I want my child to follow my directions even if s/he disagrees with my reasons[a]	.12	.49	-.07
I do not like my child to disagree with me when friends are around[a]	.02	.57	.02
In general, how do you and your child arrive at decisions?[b] (5=I let her/him decide)	.06	-.37	.14
My child acts very mature for her/his age[a]	-.17	.35	.53
My child does not have to ask my permission to do most things[a]	.10	-.01	.72
My child does not know why s/he is supposed to do what I tell her/him[a]	.07	-.06	.36

[a]Response options are: 1=never true, 2=sometimes true, 3=usually true, 4=always true
[b]Response options are: 1=I tell what to do, 2=I ask how s/he feels then I decide, 3=We discuss, we decide 4=I tell how I feel then s/he decides, 5=I let her/him decide
[c]Response options are: 1=very rarely, 7=very often
[d]Response options are: 1=not at all strict, 7=very strict

Table 2

Factor Loadings for **Methods Which Parents Use to Motivate their Children to Do Better in Math**

Motivation Practices	Factor I Extrinsic Methods	Factor II Intrinsic Methods
Offering to give rewards for better performance	.55	-.03
Getting additional help	.46	.00
Telling her/him to try harder	.46	.25
Taking away privileges	.46	-.47
Telling your child that s/he should be ashamed of her/his performance	.77	-.49
Providing home activites that use math	-.57	.64
Buying math books, games, computers, or calculators	-.52	.72
Giving her/him more help myself	.12	.35
Telling your child how much confidence you have in her/his ability	-.06	.42
Discussing future usefulness of math	-.05	.35

Response options are: 1=never, 2=rarely, 3=sometimes, 4=often

Table 3

Correlations between Parent Perceived Family Environments and Parent Reports of Child's Adjustment to Junior High School

Child's Adjustment	Factor I Conflicted	Factor II Authoritarian	Factor III Child Self-Regulating
General adjustment (1=not at all well, 7=very well)	-.27[2]		.....
Changes in school attitudes (1=much worse, 7=much better)	-.22[1]		.20[1]
Changes in math attitudes (1=much worse, 7=much better)	-.24[1]		.....
Changes in popularity (1=less popular, 7=more popular)	.....		.32[3]
Concerned about grades (1=less concerned, 7=more concerned)	-.31[2]		.....
Concerned about math grades (1=less concerned, 7=more concerned)	-.33[3]		.....
Concerned about math ability (1=less concerned, 7=more concerned)	-.29[2]		.18†
Concerned about sports ability (1=less concerned, 7=more concerned)	.....		-.21[1]
Concerned about how many friends s/he has (1=less concerned, 7=more concerned)	.....		.....
Concerned about how s/he looks (1=less concerned, 7=more concerned)	.....		.....

† $p \leq .10$
1 $p \leq .05$
2 $p \leq .01$
3 $p \leq .001$

Table 4

Correlations between Parent Perceived Family Environments and Parent Motivation Practices

Motivation Practices	Family Environments		
	Conflicted	Authoritarian	Child Self-Regulating
Offering to give rewards for better performance	.18[1]	.....	.....
Getting additional help	.....	.....	.....
Telling her/him to try harder	.17[1]	.....	-.27[3]
Taking away privileges	.25[2]	.19[1]	-.24[1]
Providing home activites that use math	-.19[1]	-.16†	.14†
Buying math books, games, computers, or calculators	.....	.....	.17[1]
Giving her/him more help myself	.....	.....	.....
Telling your child that s/he should be ashamed of her/his performance	.32[4]	.18[1]	.....
Telling your child how much confidence you have in her/his ability	-.17[1]	.....	.....
Discussing future usefulness of math	.....	.....	.....
Extrinsic Methods	.42[4]	.17†	-.27[2]
Intrinsic Methods	-.40[4]	-.22[2]	.16†

† $p \leq .10$
1 $p \leq .05$
2 $p \leq .01$
3 $p \leq .001$
4 $p \leq .0001$

Table 5

Factor Loadings for Student Perceptions of Family Environments

Item	Factor I Authoritarian	Factor II Participatory	Factor III Child Self-Regulating
I have lots of fights with my parents about their rules and decisions for me[a]	.50	.17	.07
My parents treat me more like a little kid than like an adult[a]	.43	-.13	.07
I do not know why I am supposed to do what my parents tell me to do[a]	.40	-.23	-.57
My parents trust me to do what they expect without checking up on me[a]	-.83	.29	.54
My parents want me to follow their directions even if I disagree with their reasons[a]	.58	-.39	-.59
How strict are your parents?[d] (4=not at all strict)	.01	.72	.55
How are most decisions made in your family?[b] (5=My parents let me decide)	.12	.47	-.03
How much do you take part in making family decisions that concern you[c] (4=none at all)	.02	-.59	.18
I count on my parents to solve many of my problems[a]	.09	-.11	-.66
My parents worry that I am up to something that they won't like[a]	.13	.19	.00
I must have my parents permission to do most things[a]	-.08	.11	-.24
My parents do not like me to disagree with them if their friends are around[a]	.09	-.14	-.32

[a]Response options are: 1=never true, 2=sometimes true, 3=usually true, 4=always true
[b]Response options are: 1=My parents tell me what to do,
2=My parents ask me how I feel then they decide
3=We discuss, we decide, 4=My parents tell me how they feel then I decide,
5=My parents let me decide.
[c]Response options are: 1=very much, 2=much, 3=some, 4=none at all
[d]Response options are: 1=very strict, 2=strict, 3=a little strict, 4=not at all strict

Table 6

Factor Loadings for **Student General Self-Esteem**

Item	Factor I Low Self-Esteem
...would like to stay pretty much the same	-.30
...are not very sure of themselves	.50
...wished they acted differently	.58
...are pretty sure that they are a good person	-.58
...wish they were different	.69
...think the way they do things is fine	-.62
...aren't sure whether or not they're doing the right thing	.48

Table 7

Factor Loadings for **Student Self-Consciousness in the Math Classroom**

Item	Factor Loading Math Self-Consciousness
Even when I know the right answer in math, I don't like the teacher to call on me because I wonder what the other kids will think of me	.54
Even when I do well on a math test, I don't want other kids to know how I've done	.29
When I give the wrong answer in math, I worry about what the other kids in the class think about me	.79
I feel embarrassed if the teacher corrects my answer in front of the other students in math	.71
When a lot of students are watching me do a math problem, I do worse than when I do it alone	.68

[1]Response options are: 1=not at all true of me, 2=not too true of me, 3=somewhat true of me, 4=very true of me

Table 8

Correlations between Student Perceived Family Environments and Student's Math Self-Consciousness

Item	Family Environments		
	Authoritarian	Participatory	Child Self-Regulating
I don't like teacher to call on me	.25[1]	.00	-.24[2]
	.33[2]	-.14	-.28[1]
	.11	.12	-.28[1]
	.32[1]	.04	-.30[1]
	.19	-.09	-.21
I don't want other kids to know how I've done	.07	-.05	-.11
	-.06	-.07	.05
	.28†	.00	-.28†
	.07	.02	-.07
	.09	-.02	-.11
I worry about what other kids in class will think about me	.23[1]	-.02	-.25†
	.23†	-.14	-.18
	.22	.09	-.39[2]
	.29[1]	.11	-.25†
	.17	-.20	-.31[1]
I feel embarrassed if teacher corrects my answer	.25[2]	-.09	-.22[1]
	.18	-.29†	-.32[2]
	.38[2]	-.05	-.49[3]
	.44[2]	-.01	-.45[3]
	.12	-.30[1]	-.31[1]
I do worse when others students are watching me	.26[2]	-.09	-.22[1]
	.20	-.20	-.21
	.37[2]	.01	-.30[1]
	.53[4]	.01	-.28[1]
	.04	-.32[2]	-.26†
Math Self-consciousness	.31[3]	-.10	-.35[2]
	.28[1]	-.25[1]	-.29[1]
	.37[2]	.05	-.49[3]
	.51[3]	.06	-.41[2]
	.16	-.29[1]	-.35[2]

Within each row, there are five sets of correlations listed in the following order: total sample (N's range from 91 to 105); girls (N's range from 54 to 61); boys (N's range from 37 to 44); elementary school students (N's range from 48 to 50); junior high school students (N's range from 42 to 55).

† $p \leq .10$
[1] $p \leq .05$
[2] $p \leq .01$
[3] $p \leq .001$
[4] $p \leq .0001$