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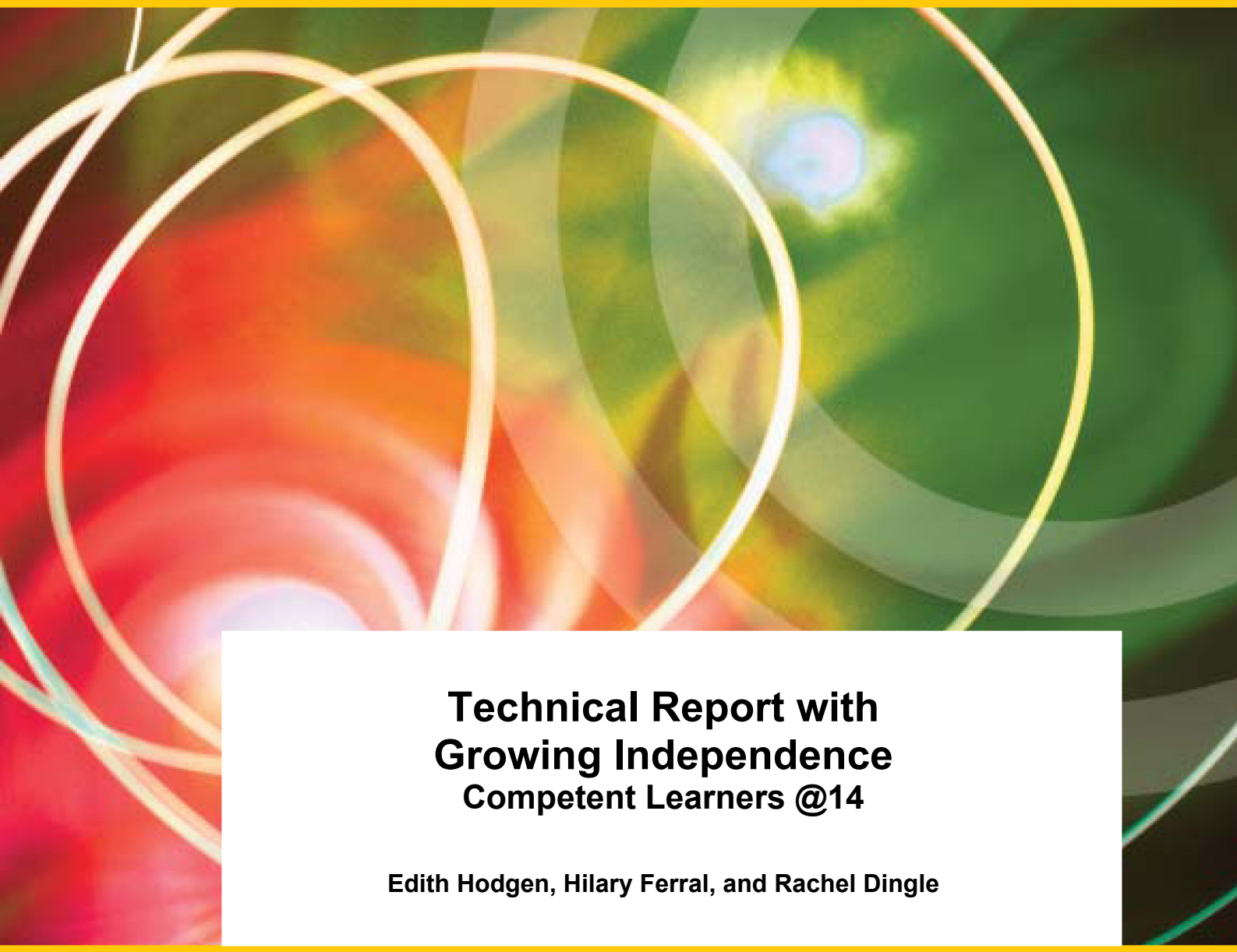

Technical Report with Growing Independence
Competent Learners @14

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Competent Learners @14

Edith Hodgen, Hilary Ferral, and Rachel Dingle

NEW ZEALAND COUNCIL FOR EDUCATIONAL RESEARCH

TE RŪNANGA O AOTEAROA MŌ TE RANGAHAU I TE MĀTAURANGA

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1. Introduction

This technical report has been written to stand alongside the fourth report on the Competent Children, Competent Learners study at 14, *Growing Independence* (Wylie & Hipkins, 2006). The report tells the story carried in the data, and this technical report provides the basis of the story: it describes the methodology used to analyse the data (and the software used to do so), and provides more detail of the results (more numbers to ponder over). The actual report probably includes less detail than previous reports in the series, allowing the story to be told more clearly and with fewer interruptions.

The ordering of the material in the two reports reflects their two different functions. In the report, *Growing Independence*, the findings are ordered according to the story. In this technical report, the findings are ordered according to the research questions as they were originally stated, as that is the order of our investigations, and so best tells the story of what we did and why (rather than that of what we found).

The report is designed to be dipped into for particular areas of interest, or to be read from cover to cover, as a "jolly good read". The technical report is designed to be consulted for deeper information about one or two aspects of the research. It has been written to be as internally consistent as possible, which does not make at all for a "jolly good read"—rather a jolly boring one. However, the design makes it possible to read a page or two of a chapter without missing out on anything that was said once earlier and then never repeated.

In the technical report we cover first the development of the scale variables, and history and cluster variables that were fundamental to all the analyses. Next we cover the types of analysis carried out, and then give the detailed results for each of the research questions in turn. We do not give details for all the cross-tabulations and chi-square tests. We give results for the linear (in the most general sense) models fitted.

2. Scale variables, history variables, and cluster variables

The students, their teachers, and parents were asked series of questions about their attitudes to or opinions about aspects of the students' school and out of school life. The responses were measured on Likert-type scales. These questions were used to construct the scale variables.

Where the questions were of the "tick if true for participant" type (binary responses), we used cluster analysis to define clusters of participants who tended to give similar responses to the questions of interest.

We have, for the past several rounds of analysis, used some history variables, based on responses to similar questions asked each time we interviewed the participants or their teachers or parents. In many ways these history variables are similar to the cluster variables, but the method of defining the categories for the history variable has been more subjective.

There are a few other derived variables that are described in this section.

We describe for each of these types of variables in turn:

- the methodology used to obtain the new variable, and
- the list of all such variables, their characteristics (where relevant), and the constituent items used to derive them.

SCALE VARIABLES

These variables were constructed from:

- Student responses to the stem:
  - School is a place where …
  - English/Mathematics/Science is a class where …
  - I feel I'm doing well at school when …
  - When I'm at home …
  - In the past year I've had happen to me …
  - My friends are …
- Parent responses to the stem:
  - Relationships at home
  - Student's way of doing things (at home)
- Teacher responses to the stem: Characteristics that describe the student in your class … were used to construct the attitudinal competencies described in the first report from the Competent Children, Competent Learners study @ 14 (Wylie, Ferral et al, 2006).
- Teacher characterisations of the students at age 8–12.
- Dean (or equivalent) description of hindrances and support for students in the participants' year.

Method

Likert-type scale items

We used principal component analysis with varimax rotation using SAS (SAS Institute Inc 1999-2001) to determine which items should constitute possible scales, and used Cronbach's alpha to get a measure of the reliability of the scales.

The actual scale variables were calculated as the unweighted mean of the Likert-scaled items indicated by the rotated principal components analysis (where necessary, items were scaled to all be on a scale with the same number of points), and converted to a 1–10 scale by a linear transformation.

The scale scores used as explanatory variables were constructed so that a higher value corresponded to more of the attribute. Sometimes this is "good", as in supportive family, or engaged in school, and sometimes this is "bad", as in disrupted learning environment or negative about English (or mathematics or science). The signs of the correlation coefficients and regression coefficients reflect the relationship between "good" and "bad" attributes: two "good" attributes tend to have a positive association, as do two "bad" ones, whereas one "good" and one "bad" have a negative association.

Other items

For seven of the scales, the student hindrances, teacher hindrances, and the five teacher characterisations of the student aged 5–12 scales (good/organised, introvert, extrovert, individualistic, and difficult) we calculated the mean of the items involved.

For the hindrance scales, this was the mean of the 4-point scale items, converted to a 10-point scale by a linear transformation.

The teachers were asked to describe the students. The question stem was: "What are the student's strengths in terms of character, how s/he conducts her/himself in your class or around the school?" or, for the less positive attributes: "What are the student's areas of difficulty, or weakness—how s/he conducts her/himself in your class or around the school?" The teachers gave a verbal description, which was recorded, and their responses were coded to the categories listed below.

The exact list of items varied slightly at different ages. The items listed below are those from age 12, which gives the flavour of the items used to construct the scale. The actual scale scores were calculated in three stages. The number of the responses to each of the items on a scale (counting how many "good" etc. responses there were for each student) at each age was counted. There were different numbers of items on the scales, so to give them equal weight the total counts were scaled to all be between 1 and 10 by a linear transformation. The scale score was calculated as the weighted mean of the responses in which the age 8, 10 and 12 totals were given the weights of 1, 2 and 3, respectively.

The subsets of the descriptors or items were determined by a comparison of a series of cluster analyses, clustering students using the teacher descriptor items. It was found that the characterisation of the clusters formed at each age were very similar (there was a "good" or organised cluster, an introverted cluster, and extroverted cluster, an individualistic cluster, and a difficult cluster), but that cluster membership varied considerably from year to year. We did use the age 12 clusters (see below) in some analyses, but also formed a scale score for each cluster characterisation averaged across several teachers over the years.

Listings of scale variables and their items

Where students and/or parents and/or teachers were asked similar questions and we put all such items into a single analysis, we found each time that they loaded onto different possible scale variables. In consequence we tended to analyse each of the banks of items indicated above separately, and the scale variables derived all tend to be derived from items from a single bank of questions; all the items are student responses, or parent responses, or teacher responses. Almost always, all the items in a scale are responses to a common stem ("School is a place where …" for example).

We obtained a number of possible scale variables that had Cronbach's alpha values of at least 0.7, each constructed from a minimum of four items. Possible scale variables with lower alpha values, or fewer items, were not used.

In the lists that follow, an (r) indicates that the scale of the item was reversed before being used to form the scale variable.

School is a place where …

Scale 1 **Engaged in school**

($\alpha = 0.79$)

- The discipline rules are fair
- I keep out of trouble
- I like my teachers
- I enjoy learning
- I get tired of trying (r)
- I get too much work to do (r)
- I skip classes (r)
- I want to leave as soon as I can (r)

Scale 2 **Confident at school**

($\alpha = 0.73$)

- I am treated like an individual
- I feel I belong
- I feel safe
- I get all the help I need
- I learn most things pretty quickly
- It's important to do my best
- I am treated like an adult
- I have good friends

English/Mathematics/Science is a class where …

The absorbed in learning score is constructed from the total of the 21 items that repeat the same seven basic items for each of the three classes. These seven items are listed once.

Scale 3 **Absorbed in learning**

($\alpha = 0.86$)

- I get totally absorbed in my work
- Things I do outside school help my learning
- When I finish my work, I check to make sure it is correct
- Students work out problems together
- When I'm writing something, I think about whether I understand what I'm doing
- I can do the hardest work if I try
- I can get help at home if I need to

Similarly, the disengaged in learning, disrupted learning environment, comparative learning environment, and challenging schoolwork scale scores are constructed from repetitions of the same items in each of the three classes.

Scale 4 **Disengaged in learning**

($\alpha = 0.85$)

- I behave in a way which annoys the teacher
- I muck around
- I can get away with not doing much work
- We keep doing the same things without learning anything new
- I don't like asking my teacher questions
- We get too much homework

Scale 5 **Disrupted learning environment**

(α = 0.84)

- Other students are distracting
- The class gets interrupted
- Students don't listen to what teacher says

Scale 6 **Comparative learning environment**

(α = 0.79)

- The teacher tells us how we compare with other students
- The teacher tells the whole class who the highest and lowest marks for their work

Scale 7 **Challenging schoolwork**

(α = 0.70)

- My teacher wants students to work hard
- I learn things that are challenging

The other scale variables tend to differentiate between the three subjects, although the resultant scale variables are still moderately correlated. The same items are used for the scale variables in each of the three subjects.

Scale 8 **Positive learning environment: English, Mathematics and Science**

(α =0.90, 0.92, and 0.93, respectively)

- My teacher gives clear instructions
- The teacher helps me do my best
- I can count on the teacher for help when I need it
- The teacher gives us clear expectations of what we are to do
- My teacher knows about what interests us
- My teacher is interested in my ideas
- My teacher keeps teaching till we understand
- The teacher gives useful feedback on my work
- The teacher is happy to explain things more than once
- The teacher uses examples that are relevant to my experience
- I enjoy doing the homework I get

Scale 9 **Positive attitude to teacher: English, Mathematics and Science**

(α = 0.80, 0.84, and 0.83, respectively)

- I like the teacher
- My teacher treats me fairly
- The teacher really understands how I feel about things
- I understand my teacher's attitudes and rules

Scale 10 **Negative about English, Mathematics and Science**

(α = 0.75, 0.81, and 0.81, respectively)

- I plan to drop English/mathematics/science as soon as I can
- I don't know how to do the work
- I am confident I can master the skills being taught (r)
- I do well (r)

I feel I'm doing well at school when …

Scale 11 **Student uses internal markers of achievement**

($\alpha = 0.86$)

- I solve a problem by working hard
- I learn something interesting
- I do my very best
- I get a new idea about how things work
- Something I learn makes me think about things
- I work really hard
- What I learn really makes sense
- I catch on quickly

Scale 12 **Student uses external markers of achievement**

($\alpha = 0.86$)

- I know more than other people
- Others get things wrong and I don't
- I have the highest test marks
- I don't have anything hard to do
- I'm the only one who can answer questions
- I don't have to try hard

When I'm at home …

Scale 13 **Family communicates well**

($\alpha = 0.80$)

- My Mum can tell when I'm upset about something
- I tell my family my problems and troubles
- My family checks that I've done my homework
- My Dad can tell when I'm upset about something
- I talk about what I'm reading
- I can talk about my hopes and plans for the future
- My family asks me about school
- I do interesting things with my parents

Scale 14 **Family pressure**

($\alpha = 0.80$)

- My Mum is always trying to change me
- My Dad is always trying to change me
- Home is more friendly if I just do what my parents want
- My parents want to control whatever I do
- My parents expect too much from me
- My family worry too much about what I do with my friends
- My parents have their own problems so I don't bother them with mine
- I need more privacy

Scale 15 **Inclusive family**

($\alpha = 0.80$)

- I get treated fairly
- I am comfortable
- My family respects my feelings
- I get help if I need help
- The expectations are fair
- Everyone is too busy to bother about me (r)

Scale 16 **Supportive family**

($\alpha = 0.87$)

- I trust my Dad
- My Dad is warm and loving towards me
- I trust my Mum
- My Mum is warm and loving towards me
- I feel close to my family
- My family really help and support each other

In the past year I've had happen to me …

Scale 17 **Risky behaviour**

($\alpha = 0.80$)

- Doing something you regretted when drunk
- Drinking alcohol
- Getting in trouble with the police
- Having sex
- Getting into a physical fight
- Breaking up with a boyfriend/girlfriend
- Getting in trouble at school
- Having to lie about something someone else did
- Falling behind with school work

Scale 18 **Dissatisfaction**

($\alpha = 0.75$)

- Feeling left out
- Not having enough freedom
- Losing control of your temper
- Having nothing to do/being bored
- Being pressured to do something you did not want to
- Not having enough money
- Losing a friend
- Trying to fit everything into your time
- Being hassled about your body size/shape
- Fighting with others at home
- Being bullied/hassled at school
- Coping with body changes

Scale 19 **Achievement and praise**

(α = 0. 71)

- Being praised for your achievements in sport or cultural activity
- Getting selected for a team or event
- Being praised for achievements
- Making a new friend
- Being included in a group you really wanted to be in
- Supporting a friend in trouble
- Taking action about a situation that concerns you
- Being praised for your achievements in a paid work situation

My friends are …

Scale 20 **Friends with risky behaviour**

(α = 0.84)

- My friends smoke cigarettes
- My friends think it is okay to have sex before you are 16
- My friends like to party and drink alcohol
- My friends wag school
- My friends smoke marijuana
- My friends get into trouble at school

Scale 21 **Solid friendships**

(α = 0.79)

- My friends listen to what I have to say
- My friends respect my feelings
- I trust my friends
- My school friends are good friends
- My friends are people my parents like
- I like to get my friends' point of view on things I am concerned about
- My friends push me to do stupid things (r)
- I wish I had different friends at school (r)
- I feel alone or apart when I am with my friends (r)

Parent responses on relationships at home

Scale 22 **Close parent-child communication**

(α = 0.76)

- I encourage the student to talk about what is happening at school
- I feel close to the student
- The student is warm and loving towards me
- The student talks about his/her problems and troubles
- I would know if the student was upset about something

Scale 23 **Parent-child friction**

($\alpha = 0.73$)

- Home would be friendlier place if the student would do as s/he was told
- I worry that their friends have too much freedom
- There are things about the student I am really trying hard to change
- Privacy is source of friction between the student and other family members
- There is a lot of friction in our home
- I trust the student to behave appropriately when in the company of his/her friends (r)
- I generally like their friends (r)
- I see the student's friends as a positive influence on him/her (r)

Student's way of doing things (at home)

Scale 24 **Parental view of student self-confidence**

($\alpha = 0.78$)

- Enjoys new experiences or challenges
- Is confident in his/her interactions with adults
- Asks a lot of questions
- Clearly explains what they have seen/done
- Takes active interest in the outside world beyond him/herself
- Expresses his/her views and needs appropriately
- Presents his/her point of view to an adult in an appropriate manner even if there's a disagreement

Scale 25 **Parental view of student self-efficacy**

($\alpha = 0.82$)

- Takes responsibility for his/her actions
- Meets any goals s/he sets her/himself
- Gets on well with his/her peers
- Shows respect for adults
- Is a good listener
- Takes optimistic view of life
- Is willing to learn from his/her mistakes
- Meets any personal promises s/he makes
- Is influenced by peer pressure to do something out of character (r)
- Acts without thinking of the consequences (r)

Scale 26 **Parental view of student responsibility**

($\alpha = 0.79$)

- Is able to remember and carry out instructions after hearing them only once
- Takes responsibility for getting organised
- Passes on messages accurately
- Finishes all his/her chores
- Follows what is being talked about in a conversation and stays on the same topic
- Asks for something to be repeated or explained again if s/he do not get it the first time
- Persists with solving a problem, even when things go wrong for a while
- Has a good concentration span when working on things that interest him/her

Listings of other scale variables

Dean (or equivalent) description of hindrances and support for students in the participant's year.

These two variables apply at the school and year level, not at the individual level, as they are measures of the environment in which the participants at the same year level at each school found themselves in during the relevant year of data collection.

Possible hindrances were measured as the mean of the Likert-scale student and teacher hindrance items, scaled to a 1–10 scale.

Scale 27 **Hindrances to learning, student causes**

- Student absenteeism
- Students disrupting classes
- Students skipping class
- Student transience
- Students lacking respect for teachers
- Students use of alcohol/illegal drugs
- Students intimidating/bullying others

Scale 28 **Hindrances to learning, teacher causes**

- Teacher absenteeism
- Teacher turnover
- Teachers being too strict
- Poor student-teacher relationships
- Range of subjects available
- Approach to the curriculum
- Teachers not meeting individual student needs
- Teachers having low expectations of students
- Students not being encouraged to achieve full potential

Age 8–12 teacher characterisation of students

The binary response items used to construct these scales are listed below.

Scale 29 **Good/organised**

- Reliable/sensible
- Leader
- Organised/concentrates/not easily distracted
- Well behaved/courteous/polite

Scale 30 **Individualistic**

- Kind/warm-hearted/tolerant/patient
- Creative/inventive
- Likes a challenge
- Happy/at ease
- Self-centred/willful/intolerant/doesn't listen to others
- Doesn't try
- Lives in own world

Scale 31 **Introvert**

- Willing
- Tries hard
- Passive/shy/too dependent
- Poor self-concept/low self-esteem/lacks friends/insecure
- Over-anxious
- Depressed/melancholic
- Thin-skinned/oversensitive

Scale 32 **Extrovert**

- Mature/independent/confident
- Outgoing/popular
- Sense of humour
- No bad attributes

Scale 33 **Difficult**

- Aggressive
- Unreliable
- Poor work habits/disorganised/impetuous
- Spoilt
- Impatient
- Immature/dependent/easily led astray
- Bossy
- Rude
- Dishonest
- No good attributes

CLUSTER VARIABLES

These variables were constructed from a range of multiple response questions (and occasionally other variables, sometimes dichotomised or converted into a series of binary variables):

- Student and parent responses to questions about the type of career the student might have; student view of the usefulness of what they learn in the three main compulsory subjects; what the student intended to do when they leave school; what things the student thinks will be important to them as an adult; how much education the parent would like for the student
- Leisure interests listed by parents
- Leisure interests mentioned by students
- Family income, and the proportion of income spent on housing, the family's ability to pay bills each month and how much money is left after paying the bills each month
- The things that are most important to the student, both now and when they are an adult
- How the teacher characterised the student at age 12
- Student subject choices

Method

Most of our clusters were formed using binary data, as this seemed the best way to make use of the information coded this way. Where non-binary variables were used in the same cluster analysis, they were usually dichotomised or turned into a number of binary variables (one for each point on the scale), because the distance measure we used was appropriate for binary variables.

We used SAS (SAS Institute Inc 1999-2001) to do the analysis. We calculated the distance matrix using the `distance` macro, provided by SAS to calculate the distance matrix. If the responses were binary, we

calculated Jaccard distances. The Jaccard *similarity* for two students would be the ratio of the number of times they both had the value of 1 to the number of times where either one or both had the value 1. The Jaccard *distance* is one minus the similarity. If the responses were not binary (for example, the parental interests), we calculated squared Euclidean distances.

We tried a variety of clustering methods and found that the Lance-Williams flexible-beta method of clustering (Lance and Williams 1966.) and the Ward method (Ward 1963) gave reasonably even-sized clusters. We checked the number of clusters to retain and the effectiveness of the clustering in defining groups with differing characteristics by comparing cluster means for the competencies and sometimes some of the scale variables. We found that usually the cluster means for the former method were more extreme than those for the Ward method, and so the flexible method was the clustering method used in this study.

Descriptions of the cluster groups were based on a comparison of item frequencies across the clusters. The description of a group was formed from the items for which the group had higher frequencies than any of the other groups (the item was over-represented in that group).

Listings of the cluster variables

We found that for several of the groups of questions that were of interest we obtained clusters that showed a clear difference across the competency scores and also many of the scale variable scores (see above). Some of these clusters were valuable in the analyses described later in this report.

Cluster membership cannot be entirely clear, nor unambiguous. However, it seems that the clusters have allowed us to define subgroups within the sample who respond differently on a variety of measurements.

Motivation

In these reports "motivation" refers to the perceived value of education, and long-term ambition of the student and for the student by their parent. This is clear from the items used to construct the clusters.

The three clusters used have been named

- University/professional orientation; high faith in gains from school
- Less positive of gains from school and less sure of future goals
- Aiming for skilled/unskilled jobs; low conviction about gains from school

The items listed below were all either binary responses or responses on a Likert-type scale that were converted to binary variables.

Scale 34 **Motivation**

- Some of the things the students enjoy about the school are:
  - good teachers
  - independence/treated as an individual/adult
  - facilities
  - extra-curricular activities
- The student thinks that they will have a career that is
  - professional
  - skilled
  - unskilled/unknown

- As an adult the student thinks that the most important things will be
  - happy family life
  - lots of money
  - lots of friends
  - an interesting job
  - a good education
  - an important job
  - doing well at sports
  - influencing other people
  - being creative/making something new
  - taking part in church/spiritual activities
  - good health
- The student thinks that when they leave school they
  - will study further
  - will travel
  - will get a job
  - have no idea what they will do
- The parent's hopes for the student's future education are
  - as far as they want to/are able to go
  - university
  - other tertiary
  - end of secondary
- The parent thinks that the student will have a career that is
  - professional
  - skilled
  - unskilled/unknown as yet
- The student aims to leave school
  - at the end of Year 12
  - at the end of Year 13
  - unsure
- The parent perceives that an expectation that the student would do well at school is
  - like us [their family]
  - not like us
- The student gains knowledge useful for their future in English/mathematics/science (entered as separate variables)
  - agree
  - neutral/ disagree.

Student values

The students were asked to indicate the three things that are most important to them now, and the thing(s) that they think will be most important to them as adults. A cluster analysis yielded three clusters:

- Anchored/achieving
- Anchored
- Standing out

Scale 35 **Student values**

- Current values:
  - wearing the right clothes/looking cool
  - being good looking
  - having money to spend
  - being helpful or kind
  - having the latest things
  - being with family/whānau/fanau
  - having a good sense of humour
  - doing well at school
  - doing well at sport
  - doing well at an interest outside school
  - going to church
  - having lots of friends
  - enjoying the things I do
- Future adult values
  - good looks
  - happy family life
  - lots of money
  - lots of friends
  - an interesting job
  - a good education
  - an important job
  - influencing other people
  - being creative/making something new
  - taking part in church/spiritual activities
  - good health

Teacher characterisation of student, age 12

The same age 12 variables that were used to form the good/organised, introvert, etc scales (see above) were used to form clusters of students who fell into the five groups. The clusters were given the same names as the corresponding scales. Students in the good/organised cluster tended to have higher than average scores on the good/organised scale, and the same was true for the other clusters and the corresponding scales.

Scale 36 **Teacher characterisation**

- Reliable/sensible
- Leader
- Organised/concentrates/not easily distracted
- Well behaved/courteous/polite
- Kind/warm-hearted/tolerant/patient
- Creative/inventive
- Likes a challenge
- Happy/at ease
- Self-centred/wilful/intolerant/doesn't listen to others
- Doesn't try
- Lives in own world
- Willing
- Tries hard
- Passive/shy/too dependent
- Poor self-concept/low self-esteem/lacks friends/insecure
- Over-anxious
- Depressed/melancholic
- Thin-skinned/oversensitive
- Mature/independent/confident
- Outgoing/popular
- Sense of humour
- No bad attributes
- Aggressive
- Unreliable
- Poor work habits/disorganised/impetuous
- Spoilt
- Impatient
- Immature/dependent/easily led astray
- Bossy
- Rude
- Dishonest
- No good attributes

Student interests

The students were asked to rate how often they were involved in various leisure activities on a scale of often/most days, once or twice a week, less than once a week, and never. These responses yielded four clusters:

- Sports player
- Computer games player/no strong interests
- Reading, arts and sport
- Creative interests

Scale 37 **Student interests**

- watch television
- read
- use a computer
- play computer/video games etc.
- hang out with friends
- do homework
- play sport for fun
- go to art/music/dance classes
- do exercise/physical training
- play competitive sport
- make things—a hobby or craft
- practice singing or playing a musical instrument
- cultural activities e.g. kapa haka

Student subject choices

The students all took the three compulsory subjects, and almost all took PE/health and social studies. There were 15 non-compulsory subjects that were taken by at least 15 students, and it was these subjects that were used to cluster the students. Selecting the number of clusters was a matter of balancing clusters with stand-out differences in competency and the number of students in each cluster. In the end, we used seven clusters. This gave reasonably big clusters, one that always had the lowest competency scores, and two or three that had higher than average competency scores. There was very little difference between the other clusters.

The seven clusters are formed of students who are likely to be doing a combination from:

- French; information technology; economics/consumer studies/financial literacy; text information management; other languages
- Māori; technology Japanese; graphics/design technology; text information management; supplementary literacy
- Technology; arts; Māori
- Arts; Māori
- Japanese; graphics/design technology; other languages
- Technology; economics/consumer studies/financial literacy; horticulture; supplementary literacy
- Technology; arts; Japanese; French; information technology; supplementary literacy; other languages.

Parental interests

The parents were asked to rate how often they were involved in various leisure activities on a scale of often/most days, once or twice a week, less than once a week, and never. These responses yielded four clusters:

- Those who read widely (books and newspapers, typically often), and reported community involvement
- Those who prefer to watch television and have low involvement in the community
- Those with mixed interests (may read, but not books, nor newspapers regularly)
- Those who prefer to watch television and have few interests.

Scale 38 **Parental interests**

- watch television
- read a book
- read a magazine
- read a newspaper
- use the Internet
- play computer/video games
- talk with friends
- do home decorating/maintenance
- garden
- play sport/exercise
- go to art/music/dance activities
- write a letter/e-mail
- do voluntary work
- make things—a hobby or craft
- go shopping
- go to a meeting for school/church/voluntary organisation
- study

Family financial situation

Ordinal-scaled variables used to form three clusters:

- Comfortable family financial situation
- Moderate family financial situation
- Difficult family financial situation

Scale 39 **Family financial situation**

- Family income (if known)
- The approximate proportion of income that was spent on housing
- The ability to pay all the family's bills each month (4-point scale from no difficulty to a great deal of difficulty)
- The amount of money left each month after paying bills (5-point scale from plenty to in debt).

HISTORY VARIABLES

In the last several rounds of analysis[1] we have developed history variables, based on responses to similar questions asked at ages 5 to 14. Some of these history variables cover only a subset of the years. For this report we developed several new history variables, and revised some others.

Method

Developing history variables was a very empirical process. We concatenated the numerical codes for the responses at each data collection round to form a string of digits as long as the number of data rounds, and then grouped the resultant strings into categories. Usually there were categories of all/almost all "good", and all/almost all "bad" (the two extreme categories), one or two clearly categorised mixtures (mainly all good/bad), and a "mixture" category (often difficult to categorise any other way).

The divisions between the categories were checked and fine-tuned by looking at boxplots and category means for the competencies and scale variables (above).

Listings of the history variables

Scale 40 **History of class size age 8–12 categories**

- Mainly small (up to 25 students)
- Mainly large (over 25)

Scale 41 **History of TV watching age 8–14 categories**

- Mainly low (up to 2 hours a day in at least 3 of the rounds)
- Mixed (everything else)
- Mainly high (over 2 hours a day in at least 3 of the rounds)

Scale 42 **History of school decile age 8–14 categories**

- Mainly low-decile (decile 1 or 2 school in at least 3 of the rounds)
- Mainly mid-decile (decile 3–8 school in at least 3 of the rounds)
- Mixed (everything else)
- Mainly high-decile (decile 9 or 10 school in at least 3 of the rounds)

Scale 43 **History of welfare receipt age 8–14 categories**

- Has not received welfare
- Has received welfare in one or two of the rounds
- Has received welfare in three of the rounds
- Has received welfare in all four rounds

Scale 44 **History of family income age 8–14 categories**

- Mainly low (Under $30K in at least 3 of the rounds)
- Mostly moderate ($30–100K in at least 3 of the rounds)
- Mixed (everything else)
- High at least once (over $100K in at least one of the rounds)

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[1] See, for example, Wylie, Thompson et al. (2004).

Scale 45 **History of family makeup age 8–14 categories**

- Mainly sole-parent (in at least 3 of the rounds)
- Mostly 2-parent, birth parents (in at least 3 of the rounds)
- Mostly 2-parent, one step-parent (in at least 3 of the rounds)
- Mostly 2-parent, combination of birth and non-birth parents (in at least 3 of the rounds)
- Mixed (everything else)

Scale 46 **History of maternal employment age 8–14 categories**

- Mainly not working (in at least 3 of the rounds)
- Mostly working part-time (in at least 3 of the rounds)
- Mostly working full-time (in at least 3 of the rounds)
- Mixed (everything else)

Scale 47 **History of homework completion age 10–14 categories**

- Mostly completes homework (in at least 2 of the rounds)
- Varies (everything else)
- Mostly does not complete homework (in at least 2 of the rounds)

Scale 48 **History of involvement in bullying age 10–14 categories**

- Never involved in bullying
- Has been involved once (as either bully or victim)
- Has been involved at least twice (as either bully or victim)

Scale 49 **History of enjoyment of reading age 8–14 categories**

This variable is based on parental reports of the students' enjoyment of reading at ages 8 and 10, and the students' reports at ages 12 and 14.

- Always enjoyed reading
- Everything else—mainly said yes or qualified yes
- Said they did not enjoy reading at least twice

Scale 50 **History of feelings about school age 6 or 8–12 categories**

For this history variable, where we had age 6 data, we used it, and for the other students we used age 8–12 data.

- Always enthusiastic
- Fairly enthusiastic (in 2 or 3 of the rounds)
- Mixed (everything else)
- Unhappy at least once

Scale 51 **History of parents and teachers working on concerns age 8–14 categories**

- Never done so
- Reported a single occurrence
- Reported doing so twice in the four rounds
- Reported doing so in three of the four rounds
- Reported doing so in each of the rounds

Previously defined history variables that were re-used in this analysis were the history of parental concerns, and history of upsets and coping with them.

Scale 52 **History of parental concerns age 8–14**

- No concerns
- Little of concern
- Greater concern at 12 than at 14
- Two concerns at 14
- Three or more concerns at 14

Scale 53 **History of upsets and coping with them age 8–14**

- No upsets
- Some upsets, but student coped with them
- A few upsets, but student coped with them
- Not coping once
- Not coping more than once

OTHER DERIVED VARIABLES

In this section we report on other derived variables that do not fit into any other category. These are attendance, current bullying, and adverse events.

Method

Different methods were used for each of these variables, and the methodology is described for each of the described variables below.

Current involvement in bullying

Students, teachers and parents were asked questions about the students' involvement in bullying. We found that there was not perfect agreement between the three accounts (nor had there been when the students were younger), and this time we used the student reports alone as our measure of bullying. We categorised the students in four groups, as shown below.

Scale 54 **Bullying at age 14 (student report)**

- Not involved in bullying
- Bullied other/s
- Was a victim
- Was both a bully and a victim

Attendance

The attendance data presented a considerable challenge. These data came as a copy of the student's report, or a printout from the various school management software packages. Attendance could be rated on a "Good" to "Unsatisfactory" (or equivalent) scale, or recorded as the number of presences, or absences. Absences could be recorded as the number of full or half days absent over a part or full year, and the total number of possible days may or may not have been recorded. For the analysis in this report, those students for whom the data were entirely missing or completely ambiguous were excluded. Otherwise an approximate rate of absence was calculated. Those who were absent up to five percent of the time (up to two weeks away from school in a year) were categorised as having a low rate of absenteeism; those who were absent 5–12.5 percent of the time (about 2–5 weeks in the year) as having a medium rate; and those absent more often as having a high rate.

Adverse events

This variable was derived from a number of questions asking about the occurrence of events or feelings that would in one or other sense be "bad". We counted how many questions for each student indicated that adverse event(s) had occurred. This variable can be seen as an indicator of how often a student has been marginalised, alienated, has suffered loss or family problems in the last year or so. The categories we used were:

- No adverse events
- One instance reported
- Two or more instances reported

Note that an item such as "Out of school I felt lonely" would count towards adverse events if the student reported that they often or always felt that way. The same is true for the other "out of school" items.

Scale 55 **Adverse events at age 14**

- At school the student has
  - felt lonely
  - felt sad
  - had a hard time from someone
- Out of school the student has
  - felt lonely
  - not been listened to
  - reported that their parents do not trust their judgement
  - experienced a family break-up
  - moved to live with other family member/s
  - had health problem/s
  - had unwanted sex
  - been hassled about their culture
  - been in love (with bad consequences)
  - suffered the death of a friend
  - been hassled about their sexuality
  - had an accident

3. Method for analysis

We first give an overview of the methodologies used, and then discuss the techniques used in greater detail.

OVERVIEW

The research questions we answered, and the methods used for each are summarised in Table 1–9.

Research Question 2: Early cognitive competencies and attitudinal competencies related to age 14 competencies and engagement variables

Research Question 2: Do earlier literacy and numeracy performance have more of a bearing than earlier levels of social skills, perseverance, communication, and individual responsibility on age 14 competency levels[2], learning engagement, school attendance, and the out of school activities which are positively associated with competency levels?

Table 1 **Research Question 2: Analysis**

Cross-tabulations and chi-square tests	One-way ANOVAs/simple regressions	Bigger linear or generalised linear models
Attendance by • demographics (gender, ethnicity, maternal qualifications, family income) • clusters (motivation, parent interests, financial situation, student leisure activities, values) Details not given in this technical report.	Engagement scale variables[a] by • Social and cognitive competencies age 5–12 and by • attendance rates at age 14 • motivation • current enjoyment of reading • student leisure activities	Multiple regressions: • Engagement scale variables[a] regressed on • Age 5–12 cognitive competencies • Age 5–12 mean attitudinal composite competency

[a] ***Engagement scale*** *variables*: Engaged in school; Confident in school; Disengaged in learning; Absorbed in learning; Negative and positive perceptions of the classroom environment

Research Question 3: Mitigating low parental qualifications and family income

Research Question 3: What are some key factors which can mitigate the effect of low parental qualifications and low income on competency levels?

Table 2 **Research Question 3: Analysis**

Cross-tabulations and chi-square tests
Used a sub-sample: students from low-income families.
Cross-tabulations by a wide variety of student, parent and teacher items, including demographics and competencies.
The details are not given in this technical report.

[2] Analysis of age 14 competency levels are covered in a previous report (Wylie, Ferral et al, 2006)

Research Question 6: Earlier attitudinal competencies related to age 14 peer relationships

Research Question 6: How are earlier competency levels in social skills, parental and teacher reports of attitude to school and relevant school behaviour, from age 6 on, related to relations with peers at age 14 both in and out of school, experience of bullying, and risk behaviours?

Table 3 **Research Question 6: Analysis**

Cross-tabulations and chi-square tests	Correlations	One-way ANOVAs	Bigger linear or generalised linear models
• Current involvement in bullying by • Home and family variables[a]	Correlations between • Friends with risky behaviour • Risky behaviour • Solid friendships and • Age 5–12 attitudinal, and cognitive competencies • Teacher characterisation scales (good/organised, etc.)	• Friends with risky behaviour • Risky behaviour • Solid friendships by • Home and family variables[a] Also: • Same models including maternal qualification and family income	• Friends with risky behaviour • Risky behaviour • Solid friendships regressed on • Age 5–12 social and cognitive competencies • Teacher characterisation scales (good/organised, etc.) • Home and family variables[a]

[a] ***Home and family variables*:** number of schools attended; number of house shifts since birth; history of parental concerns; history of parent and teacher working on concerns; history of upsets and coping with them; history of family stability/makeup

Research Question 7: Earlier attitudinal competencies related to age 14 competencies and engagement variables

Research Question 7: How are earlier competency levels in perseverance, communication, and individual responsibility, parental and teacher reports of dispositions and ability to cope with problems, related to competency levels at age 14 and attitudes to school, including motivation, attendance, and engagement?

Table 4 **Research Question 7: Analysis**

Cross-tabulations and chi-square tests	Correlations	One-way ANOVAs	Bigger linear or generalised linear models
• Motivation clusters by • School and home variablesa • Quartile groups for age 8–12 social and cognitive competencies • Quartile groups for teacher judgement scale variables at age 12	Correlations between • Age 14 cognitive and attitudinal competencies • Twenty scale variables (including school engagement variables, and excluding those about friendships) and • Social competencies age 5–12 • Teacher characterisations of students (good/organised, etc.)	• Age 14 cognitive and attitudinal competencies • Twenty scale variables (including school engagement variables, and excluding those about friendships) by • School and home variables[a] Also: • Same models including maternal qualification and family income	• Age 14 cognitive and attitudinal competencies • Twenty scale variables (including school engagement variables, and excluding those about friendships) regressed on • School and home variablesa • Age 8–12 social and cognitive competencies • Teacher characterisations of students (good/organised, etc.)

[a] ***School and home variables*:** history of parents and teachers working on concerns; history of upsets and coping with them; history of TV watching; history of enjoyment of reading; history of feelings about school

Research Question 8: Current peer relationships related to current engagement variables

Research Question 8: How are current attitudes to school, including motivation and engagement, problem-solving approaches, and competency levels at age 14 related to patterns of peer relations in and outside school, experiences of bullying, and perceptions of the school and class environment?

Table 5 **Research Question 8: Analysis**

Correlations	One-way ANOVAs	Bigger linear or generalised linear models	Other
Correlations between • Age 14 cognitive and attitudinal competencies • Five scale variables (overall achievement, and engagement variables[a]) and • Twenty-five scale variables, including those about friendships • Teacher characterisations of students (good/organised, etc.)	• Age 14 cognitive and attitudinal competencies • Five scale variables (overall achievement, and engagement variables[a]) by • Home, family, student experience variables[b] Also: • Same models including maternal qualification and family income	• Age 14 cognitive and attitudinal competencies • Five scale variables (overall achievement, and engagement variables[a]) regressed on • Twenty-five scale variables, including those about friendships • Teacher characterisations of students (good/organised, etc.) • Home, family, student experience variables[b]	Classification tree and discriminant analysis used to attempt to predict motivation grouping

[a] ***Engagement variables*****:** engaged in school; disengaged in learning; confident in school; absorbed in learning;

[b] ***Home, family, student experience variables*****:** financial situation; parent leisure activities/interests; student leisure activities; student values clusters; subject choice clusters; adverse events; history of bullying; current bullying

Research Question 9: Three versions of the truth: student, parent and teacher

Research Question 9: What consistency is there between young adult, parent, and teacher reports of the teenagers' engagement in learning, attitudes to school, and overall performance?

Table 6 **Research Question 9: Analysis**

Correlations
Correlations between student parent and teacher variables Student: • School engagement variables Parent: • Views of student (confidence, effectiveness, responsibility) • Views of student's feelings about school, teachers • Views of teacher support for student's learning and emotional well-being • Satisfaction with student's progress • Concerns about student and school Teacher (mean of English, mathematics and science teachers): • Attitudinal competencies • Overall achievement (relative to peers)

Research Question 10: Age 14 competencies and student, parent and teacher perceptions

Research Question 10: What consistency is there between competency levels at age 14 and young adults' judgements of their school experiences, parental satisfaction with their student's school, whether the school was the first choice of parents and young adult, the level of parental involvement in the school, and teacher perceptions of the young adult's school engagement, and the parental support from their learning?

Table 7 **Research Question 10: Analysis**

Correlations	Linear models
Correlations between Competencies • Attitudinal competencies • Cognitive competencies • Teacher perception of overall student achievement Student variables • School engagement variables • Whether school was first choice Parent variables • Whether school was first choice • Views of student's feelings about school • Views of teacher support for student's learning and emotional well-being • Whether feel welcome at school • Satisfaction with student's progress • Concerns about student and school Teacher/Dean variables • View of parental support for schoolwork • Teacher related hindrances Student related hindrances	Analysis of Covariance[a] • Attitudinal competencies at age 14 • Cognitive competencies at age 14 • Overall student achievement at age 14 regressed on • Maternal qualification • Income • School decile and Student variables • Whether school was first choice Parent variables • Whether parent felt welcome at school • Satisfaction with student's progress • Parental concerns about student and school Teacher variables • View of parental support for schoolwork

[a] All models included maternal qualification, income, and school decile as explanatory variables. Student, parent and teacher variables were added separately to detect effects over and above the first three variables.

Research Question 11: School choice and satisfaction with school attended

Research Question 11: Do different population sub-groups and different levels of competency at age 12 show different patterns of decision-making about secondary school choice, success in gaining access to the secondary school which was their first choice, satisfaction with the secondary school their student is in, and satisfaction with their student's transition to school and their school progress? Is satisfaction with the secondary school dependent on its being the first choice of the family?

Table 8 **Research Question 11: Analysis**

Cross-tabulations and chi-square tests	One-way ANOVAs	Bigger linear or generalised linear models
• Multiple cross-tabulations, not reported in detail in this technical report	• Twenty-two scale factors • Age 12 cognitive and social competencies by • whether the student was involved in the choice of school	• Engaged in school, • Disengaged in learning, • Absorbed in learning • Confident in school regressed on • overall achievement/cognitive competency scores • whether the school was first choice • whether the student would choose the school again • whether the student was involved in the choice of school • decile • maternal qualifications and family income

Research Question 12. Subject choice

Research Question 12. What personal interest, peer, school, and home factors influence the subject choices which students make at the start of secondary school, and how do these choices relate to their understanding of qualifications and their aspirations?

Table 9 **Research Question 12. Analysis**

Cross-tabulations and chi-square tests
All scale and continuous variables were split into quartile groups
• Subject clusters
by
• Competencies • Attitudinal competencies (ages 12 and 14) • Cognitive competencies (ages 12 and 14)
Student variables
• School engagement variables • Friendship variables • Family dynamic variables • Out-of-school views (including risky behaviour, achievement and praise) • Student leisure activities
Parent variables
• Parent views of student
Teacher
• Perception of overall achievement • Student related hindrances
History variables
• TV watching • Homework completion • Feelings about school • Adverse events
Demographics
• Student gender • School decile, type, size
Not reported in detail in this technical report

DETAILS OF ANALYSIS

Retrospective questions

To answer research question 2, we had "continuous" competency variables from earlier years and of interest was the effect of these on current discrete (typically cluster) variables. Attempts to use generalised linear models (multinomial dependent variable), classification trees or linear discriminant analysis found that the earlier competencies were poor predictors of current group membership. However, turning the question around, and fitting a series of ANOVA models, where the earlier competency was the dependent variable and the current group membership was the explanatory variable gave a useful insight into these associations.

This technique gives a clear picture of trends that were consistent over time, but typically were weaker for age 5–8 competencies than for age 12 competencies.

Note that the models between age five and six variables and the current variable of interest are based on approximately 260 observations, and the corresponding models between the age 8–12 variables are based on approximately 474 observations.

"Continuous" outcome questions

For the analyses where we have one or more "continuous" outcome variables, at least one "continuous" explanatory variable and at least one cluster or history variable, we used a combination of correlations, one-way analysis of variance (ANOVA) and more complex linear models.

We present results first for each of the possible explanatory variables in turn; correlations for "continuous" scale variables, and results of one-way ANOVA models for the history and cluster variables. This enabled us to judge which of the explanatory variables showed stronger associations with each dependent variable. The adjusted R^2 can be taken as an upper bound for the effect size of the variables, as it is of the same order of size as an effect size for the variable in the model with no other variables (the effect size may decrease in a larger model containing similar variables).

Note that the correlations between age five and six variables and the outcome variable of interest are based on approximately 260 observations, and the corresponding correlations between the age 8–12 variables are based on approximately 474 observations.

For each of the "outcome" variables, we fitted a regression model using the explanatory variables that had low (0.13–0.4, if the relationship is positive) to moderate (0.4–0.6) or high (over 0.6) correlations with the outcome variable.

From this model we dropped terms that were not statistically significant (we tested each term as if it were fitted last in the model, so that we could see if it added any information over and above that contributed by all the other variables in the model).

Next we tested which of the cluster variables and history variables added significantly to the model we had obtained (that is, we extended the model to what is often called analysis of covariance).

Decisions about which variables to drop were based mainly on the F-test (Type III sums of squares), but also on the change in the AIC (Akaike's Information Criterion) and in the adjusted R^2 value.

Finally we checked again whether any of the variables could be dropped from the model that included both continuous-type scale scores and discrete cluster, history or other variables.

It is worth noting that there were probably issues with multicolliniarity in fitting several of the models, in spite of the fact that none of the explanatory variables in any one model had correlations much over 0.6 with any of the other variables included.

For example, when conducting the analysis for research question 7, the age 5–12 attitudinal competencies were explanatory variables, and they showed weak to moderate inter-correlations. For any round of data collection, we included either the separate attitudinal competencies (perseverance, individual responsibility, etc.) or the mean attitudinal composite competency, as the composite score was highly correlated with the individual competency scores. We compared a model using only the three (age 8, 10, and 12) composite scores and one using the separate scores at each age, and in almost every instance the separate scores appeared to be preferable (larger R^2, lower AIC). The inter-correlations between the separate scores seldom exceed 0.6. Nevertheless, several of the models fitted proved to have regression coefficients with the opposite sign to that of the corresponding correlation coefficient, and variance inflation factors[3] that were between 3 and 10. Usually the "offending" variable with the coefficient with the "wrong" sign was one of the variables more weakly correlated with the outcome variable. Removing this variable from the model often led to several other variables also being dropped (without changing either the AIC or value of R^2 by much), and caused relatively marked changes in the values of the estimates of the coefficients (or some of them) and their standard errors (a further indication that the underlying problem was multicollinearity). The variance inflation factors for the final model were typically between a little over 1 and 2.

The model presented for an outcome variable is one of many models that could be fitted, depending on the order in which the variables are inserted into or deleted from the model, or even which of two relatively highly correlated variables we chose to use in the model. We have tried to keep the models "reasonable". Does this mean that the variables not used in the model are not important? No. They are not even necessarily less important. The truth of the matter is that they are all associated, and it is difficult to determine the directions of the associations. If, for example, someone has a high mathematics score, is this because they have a positive attitude to their mathematics teacher, or the other way round? And how does being negative about mathematics come into it? Does being negative affect the score, or the attitude to the teacher, or is it the score that affects attitude? Are attitudes to subject and teacher caused by a general level of engagement in school, or is it the other way round? Or does the one affect the other which then affects the first, in a spiral of effects? If being negative about mathematics is dropped from a model, we cannot say the variable is not important. It is very likely that the information that variable provides is being provided by a combination of associated variables (in this case, engagement in school and attitude to mathematics teacher, say).

To report the results, we give the parameter estimates and their standard errors for the scale variables and competencies. The scale variables are on one-to-ten scales, and the competencies have been scaled from percentages to one-to-ten scales to match. The parameter estimate is the amount the outcome variable would increase (or decrease, if the coefficient is negative) for a single unit increase in the explanatory variable, if all other variables were held constant. The bigger the increase, or decrease, the more important that particular variable was in the model in explaining the variability in the outcome variable. It is important to note that the standard errors of the estimates are relatively large, which means that confidence intervals for the estimates are wide. The values quoted should be seen to be indicative only of the effect of each variable. Changing the variables in the model (for example replacing one variable with a correlated variable) frequently caused the parameter estimates (or some of them) to vary, sometimes to a marked extent. This is because the coefficient (parameter estimate) is the rate of increase or decrease *if all other variables are held constant*, and so depends on *which* variables *are* in the model.

There are several possible equivalent parameterisations for discrete variables or factors in linear models. We have used the corner point parameterisation, where effectively the parameter estimate for the reference group is 0, and the parameter estimates for the other levels of the variable are the amounts by which the group means are greater or less than the mean of the reference group (if all other variables are held constant).

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[3] VIFs measure the extent to which the variance of a regression estimate is inflated by multicollinearity. The minimum value is 1 (indicating no inflation), and there is no upper limit. In this study, values over three appear to indicate possible problems.

We report the results for the history and cluster variables as

- The overall *p*-value for the *F*-test of the variable (a comparison of two models, one with the history or cluster variable, and one without), written on the same line as the name of the variable.
- The estimate of the parameter estimate (the amount by which the level of the variable differs from the reference level, if all other variables are held constant) and its standard error, and the *p*-value of the *t*-test of whether the coefficient is zero or not.
- Note that this is equivalent to testing whether each level of the variable is significantly different to the reference level (which is given in the listing of the levels at the beginning of the sections), which has a coefficient of 0.
- Usually, the larger (in absolute value, or disregarding the sign) the coefficient, the smaller the *p*-value, unless two approximately equal coefficients have very different standard errors, in which case a smaller coefficient with a smaller standard error can have a smaller *p*-value than a larger coefficient with a larger standard error.

We also quote the value of adjusted R^2 (adjusted for the number of parameters used in the model) for the model, the percentage of the variability in the outcome variable that is explained by all the other variables in the model, and the *p*-values for each of the coefficients where each one is calculated as if that variable had been fitted last.

We attempted to use path analysis to fit models that spanned the research questions. However, given the degree of inter-correlation (without obvious direction), we found that the models were unstable, and also gave indications of similar problems to the multicollinearity issues that arose when fitting the linear models. We decided not to pursue these models.

School choice and comparing versions

To measure similarities between student, parent, and teacher responses to similar or related items, we used correlations (Pearson's product-moment correlation), as most of the variables were "continuous" scale variables. Some, however, were ordered categories, but for consistency we used the same correlation coefficients as they would give a good indication of the strength of the relationship, and the results for all types of variable were immediately comparable.

When examining the satisfaction with the school and choice of school, for each pair of continuous variables (competencies vs. the others), we examined consistency using correlations. Where a non-competency variable was not continuous we fitted a regression model to each "outcome" variable (all the competencies) using the explanatory variables: education of mother, family income at 14, school decile and the discrete variable of interest.

The models presented are with the discrete variable fitted last to enable us to measure the effect it has making allowance for the other coefficients included in the model (education of mother, family income, school decile).

To report the results, we give the mean competencies for the groups, the *p*-values for each of the discrete variables (that is, the *p*-value of the *F*-test comparing a model including the variable with one excluding the variable), a measure of effect size and the value of adjusted R^2 for the model, the percentage of the variability in the outcome variable that is explained by all the other variables in the model. We used η_p^2 to measure

effect size.[4] Inclusion of the adjusted R^2 and the effect size in the report allows a comparison of the extent to which the variable of interest or the demographic variables account for the variability in the outcome variable. Adjusted R^2 is reported as a percentage, as is the effect size.

Which income?

We have family income at age 5 and family income at age 14. We have found that when we include family income in, typically, linear models, the results support the idea that family income at age 5 is a proxy for the advantages early in life that appear to affect aspects of later life. In particular, it is family income at age 5 that appears to explain more of the variability in the cognitive competencies, in particular mathematics. Income at age 14 is a proxy for current advantages that appear to explain more of the variability in the attitudinal competencies, and engagement and other scale variables.

When fitting models that were to include family income, if there was any doubt as to which of the family income variables was more appropriate, we typically fitted a model with family income at 5, and another with family income at 14, and reported which accounted for more of the variability in the outcome variable. In instances where clearly one or other was more appropriate on substantive grounds we used only that one, and indicate clearly which was used.

Ten-point scales or percentages?

In previous reports on the Competent Children, Competent Learners project, the competencies have been reported as percentages. In this report we have introduced the scale variables, which were put on 1–10 scales as this reflected their origins in Likert scales 1–10 scales are easy to understand, and regression coefficients associated with 1–10 scales are also easy to understand. Where in a single analysis or series of analyses both competencies and scale variables are used, we have converted the measures to a common scale. For clarity the scales used are summaried:

- Research question 2: only competencies, percentages used
- Research questions 6–8, 11: competencies and scale variables used. In models and reports, competencies divided by 10, although the graphs still use percentages.
- Research questions 9 and 10: percentages used, and 1–10 scale for overall achievement converted to approximate percentage.

Interpreting the boxplots

The form of boxplot used in this report conveys more information than traditional box-and-whisker plots.

All boxplots show:

- the median (heavy line inside the box, more or less across the middle)
- upper and lower quartiles (top and bottom of the box)
- highest and lowest values observed (the end of the whiskers); our boxplots show relatively extreme values (possible outliers) as circles beyond the end of the whiskers.

In addition, these boxplots

- are sorted by the values of the medians, so they are always increasing from left to right

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[4] There are three commonly used measures of effect size used with ANOVA: η^2 which is the proportion of the total variance that is attributed to an effect in the sample; η_p^2 which is the proportion of the effect and residual variance that is attributable to the effect in the sample; and ω^2 which is an estimate of the total variance attributable to an effect in the population. Where more than one explanatory variable is included in a model, η_p^2 or ω^2 are more appropriate. Software such as SPSS produce η_p^2 by default. In general the value of η_p^2 is about twice that of ω^2 (the former is the estimate for the *sample*, the latter for the *population*). Where there is a single explanatory variable, unadjusted R^2 and η^2 are of the same order of size, as are adjusted R^2 and η_p^2.

- indicate the relative sizes of the subgroups, as the width of the boxes is proportional to the number of observations in the respective subgroups
- use notches to indicate approximate confidence intervals for the medians; where the notches of two boxes do not overlap, the medians are probably significantly different, and the same is likely to be true for the corresponding means.

SOFTWARE USED

Classification tree models were fitted using the function `rpart` in the package `rpart` as part of R (R Development Core Team 2003).

Linear discrimination analysis was carried out using the function `lda` in the package `MASS` in R, or using `proc discrim` in SAS (SAS Institute Inc 1999-2001).

Linear models were fitted using `proc glm` in SAS (one-way ANOVAs, mainly), or the function `lm` in R. Terms to be added to or dropped from the models were identified using the functions `addterm` and `dropterm` in the package MASS in R. The variance inflation factors were calculated using the function `vif` in the package DAAG in R.

4. Results: Research question 2

Research question 2: Do earlier literacy and numeracy performance have more of a bearing than earlier levels of social skills, perseverance, communication, and individual responsibility on age 14 competency levels, learning engagement, school attendance, and the out of school activities which are positively associated with competency levels?

To answer this question we took age 5–12 cognitive competencies and the mean attitudinal composite competencies as explanatory variables and regressed a set of age 14 scale variables (engaged in school, disengaged in learning, absorbed in learning, confident at school, negative about English, mathematics and science) on them.

To investigate the association between the earlier competencies and current motivation, attendance, and out of school activities (student leisure activities) and earlier competencies, we investigated using techniques such as multinomial models, classification trees and discriminant analysis, but the models had very poor predictive power. Instead we used one-way ANOVAs with the age 5–12 variables as outcome variables, and the age 14 cluster or other variables as explanatory variables. This gives answers to an alternative formulation of the question: "Is competency history different for the different groupings we find at age 14?" Most of the analyses gave a clear indication of a decreasing but persistent association between the two over time.

Learning engagement

There is some evidence that, in general, previous competency levels have associations with current levels of engagement. The most marked effects are the association between being negative about mathematics at age 14 and level of achievement in mathematics going back to age 5. The relative importance of the earlier competencies tends to decrease over time, and often, particularly for the engagement scale variables, it is the age 12 mean attitudinal composite competency that is more important than the cognitive competencies. On their own, previous competency levels are not particularly good predictors of current engagement – the adjusted R^2 statistic ranges from 1 to 11 percent, mostly the lower end of the scale.

We report the results of the series of regressions back across time for each of the age 14 variables of interest (Table 10–15). Each table contains the regression parameter estimates (and their standard errors), and the adjusted R^2 (the proportion of the variance in the dependent variable explained by the model).

Table 10 **Regression models for engaged in school by age 5–12 competencies**

Age	Mathematics/ Number knowledge	PAT reading comprehension/ Word recognition	Logical problem solving	Mean attitudinal composite	R^2 (%)
12	0.02 (0.04)	0.09 (0.04)*	0.07 (0.07)	0.20 (0.05)****	11
10	0.11 (0.04)*	0.08 (0.04)	0.04 (0.06)	0.06 (0.05)	9
8	0.09 (0.04)*	0.06 (0.04)	-0.05 (0.05)	0.14 (0.05)*	7
6	0.21 (0.08)**	0.06 (0.10)	-0.10 (0.06)	0.20 (0.08)*	9
5	0.12 (0.06)*	0.05 (0.07)	0.03 (0.04)	0.05 (0.09)	4

* $0.05 < p < 0.01$ ** $0.01 < p < 0.001$ *** $0.001 < p < 0.0001$ **** $p < 0.0001$

Table 11 **Regression models for disengaged in learning by age 5–12 competencies**

Age	Mathematics/ Number knowledge	PAT reading comprehension/ Word recognition	Logical problem solving	Mean attitudinal composite	R^2 (%)
12	-0.03 (0.04)	-0.02 (0.04)	-0.05 (0.06)	-0.20 (0.04)****	8
10	-0.04 (0.04)	-0.04 (0.04)	-0.03 (0.05)	-0.16 (0.05)***	7
8	-0.07 (0.04)*	-0.02 (0.03)	0.03 (0.05)	-0.12 (0.05)*	5
6	-0.18 (0.07)**	0.02 (0.08)	0.14 (0.05)*	-0.20 (0.07)**	9
5	-0.07 (0.05)	-0.04 (0.05)	0.05 (0.04)	-0.12 (0.08)	2

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 12 **Regression models for absorbed in learning by age 5–12 competencies**

Age	Mathematics/ Number knowledge	PAT reading comprehension/ Word recognition	Logical problem solving	Mean attitudinal composite	R^2 (%)
12	0.03 (0.03)	0.03 (0.04)	-0.03 (0.06)	0.11 (0.04)**	3
10	0.03 (0.04)	0.03 (0.03)	0.01 (0.05)	0.05 (0.04)	2
8	0.002 (0.03)	0.03 (0.03)	-0.01 (0.04)	0.08 (0.04)	1
6	-0.05 (0.06)	0.05 (0.08)	-0.003 (0.05)	0.18 (0.06)**	3
5	0.03 (0.05)	-0.01 (0.05)	-0.01 (0.03)	0.09 (0.07)	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 13 **Regression models for negative about English by age 5–12 competencies**

Age	Mathematics/ Number knowledge	PAT reading comprehension/ Word recognition	Logical problem solving	Mean attitudinal composite	R^2 (%)
12	0.05 (0.04)	-0.11 (0.05)*	-0.07 (0.08)	-0.23 (0.05)****	8
10	-0.09 (0.05)	-0.07 (0.05)	0.07 (0.07)	-0.07 (0.06)	3
8	-0.07 (0.04)	-0.10 (0.04)*	0.15 (0.06)**	-0.12 (0.06)*	5
6	-0.05 (0.09)	-0.07 (0.11)	0.12 (0.07)	-0.26 (0.09)**	4
5	-0.11 (0.06)	-0.02 (0.07)	0.03 (0.05)	-0.21 (0.10)*	3

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 14 **Regression models for negative about mathematics by age 5–12 competencies**

Age	Mathematics/ Number knowledge	PAT reading comprehension/ Word recognition	Logical problem solving	Mean attitudinal composite	R^2 (%)
12	-0.29 (0.05)****	0.05 (0.05)	-0.13 (0.08)	-0.08 (0.06)	11
10	-0.17 (0.06)**	-0.07 (0.05)	-0.10 (0.08)	0.03 (0.07)	9
8	-0.18 (0.05)***	-0.03 (0.05)	-0.13 (0.07)*	0.01 (0.07)	9
6	-0.27 (0.10)**	0.07 (0.12)	-0.11 (0.08)	-0.07 (0.10)	9
5	-0.19 (0.07)**	0.14 (0.08)	-0.08 (0.05)	-0.08 (0.11)	4

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 15 **Regression models for negative about science by age 5–12 competencies**

Age	Mathematics/ Number knowledge	PAT reading comprehension/ Word recognition	Logical problem solving	Mean attitudinal composite	R^2 (%)
12	-0.15 (0.05)**	-0.15 (0.06)**	0.04 (0.09)	0.01 (0.06)	9
10	-0.05 (0.06)	-0.20 (0.05)***	-0.06 (0.08)	0.07 (0.07)	7
8	-0.04 (0.05)	-0.11 (0.05)*	-0.13 (0.07)	0.05 (0.07)	4
6	-0.21 (0.10)*	0.15 (0.13)	-0.05 (0.08)	-0.06 (0.10)	1
5	-0.10 (0.07)	-0.06 (0.09)	0.02 (0.06)	-0.01 (0.11)	< 1

* $0.05 < p < 0.01$ ** $0.01 < p < 0.001$ *** $0.001 < p < 0.0001$ **** $p < 0.0001$

Risky behaviour: self and friends

There is some evidence that, in general, competency levels at age 12, particularly the attitudinal composite, have associations with current levels of risky behaviour of the student and their friends.

We report the results of the series of regressions back across time for each of the age 14 variables of interest (Table 16 and 17). Each table contains the regression parameter estimates (and their standard errors), and the adjusted R^2 (the proportion of the variance in the dependent variable explained by the model).

Table 16 **Regression models for risky behaviour by age 5–12 competencies**

Age	Mathematics/ Number knowledge	PAT reading comprehension/ Word recognition	Logical problem solving	Mean attitudinal composite	R^2 (%)
12	0.02 (0.04)	-0.12 (0.04)**	0.09 (0.06)	-0.14 (0.04)***	6
10	0.01 (0.04)	-0.06 (0.04)	-0.07 (0.06)	-0.06 (0.05)	2
8	0.04 (0.04)	-0.05 (0.03)	-0.03 (0.05)	-0.09 (0.05)	1
6	-0.04 (0.07)	-0.12 (0.09)	0.06 (0.05)	-0.01 (0.07)	< 1
5	-0.03 (0.05)	0.01 (0.06)	0.01 (0.04)	-0.01 (0.08)	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 17 **Regression models for risky behaviour of friends by age 5–12 competencies**

Age	Mathematics/ Number knowledge	PAT reading comprehension/ Word recognition	Logical problem solving	Mean attitudinal composite	R^2 (%)
12	0.01 (0.05)	-0.10 (0.06)	0.05 (0.09)	-0.17 (0.06)**	3
10	0.06 (0.06)	-0.09 (0.06)	-0.14 (0.08)	-0.07 (0.07)	2
8	-0.04 (0.05)	-0.02 (0.05)	-0.002 (0.07)	0.004 (0.07)	< 1
6	-0.15 (0.10)	-0.06 (0.13)	0.12 (0.08)	0.02 (0.140)	< 1
5	-0.09 (0.07)	0.04 (0.08)	0.06 (0.06)	-0.10 (0.11)	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Motivation

Table 18–21 give the mean scores (percentages) for the competencies at each year level across the three motivation clusters, and the adjusted R^2 (the proportion of the variance in the dependent variable explained by the model). The "high" motivation group is that where the student is perceived likely to end up in one of the professions and education is valued highly. The "low" group is that where the student is perceived to be likely to end up in a skilled or unskilled job and little value is placed on education, and the unsure group are those in between.

The probabilities indicated in the tables below are the probability that the score of the low group or unsure group is significantly different to that of the high group.

There are clear differences in mean competency between the groups, going back several ages (rounds of data collection); right from age 5 for mathematics and reading comprehension. These differences between the mean scores of the motivation groups tend to increase (become more marked) over time as the child gets older.

Table 18 **ANOVA models for mathematics/early number knowledge age 5–12 by motivation clusters**

Age	High group	Unsure group	Low group	R^2 (%)
12	59	55	42****	9
10	70	66	56****	6
8	70	67	56****	6
6	82	78	73****	6
5	56	54	45***	5

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 19 **ANOVA models for PAT reading comprehension/word recognition/early literacy age 5–12 by motivation clusters**

Age	High group	Unsure group	Low group	R^2 (%)
12	63	57**	44****	13
10	57	52*	40****	10
8	47	41*	33****	7
6[a]	22	20	14****	8
5	74	71	65**	4

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

[a] This score is based on the proportion of words recognised. The scores for beginning readers are low, as the test is designed to be used by children over several years as they master the ability to read.

Table 20 **ANOVA models for logical problem-solving age 5–12 by motivation clusters**

Age	High group	Unsure group	Low group	R^2 (%)
12	74	72	66****	7
10	66	63*	57****	8
8	51	48	43****	5
6	56	56	53	< 1
5	66	67	59	2

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 21 **ANOVA models for mean attitudinal composite scores age 5–12 by motivation clusters**

Age	High group	Unsure group	Low group	R^2 (%)
12	76	71**	65****	6
10	73	70*	67****	4
8	71	68	65****	3
6	73	68**	67**	3
5	75	74	73	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Current TV watching

Tables 22–26 give the mean scores (percentages) for the competencies at each year level across the four categories of current (daily) TV watching, and the adjusted R^2 (the proportion of the variance in the dependent variable explained by the model).

The probabilities indicated in the tables below are the probability that the score of the low group (under 1.5 hours watching TV per day) or middle group (1.5–3 hours) is significantly different to that of the high group (over three hours).

There are clear differences in mean competency between the groups, right from age 5. These differences tend to increase over time. However, by itself, TV watching accounts for a very small proportion of the variability in competency score.

Table 22 **ANOVA models for mathematics/early number knowledge age 5–12 by current TV watching**

Age	Under 1.5 hours	1.5–3 hours	Over 3 hours	R^2 (%)
12	55	50	47**	1
10	67	62	57**	2
8	66	64	59*	1
6	79	77	74	< 1
5	54	51	47	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 23 **ANOVA models for PAT reading comprehension/word recognition/early literacy age 5–12 by current TV watching**

Age	Under 1.5 hours	1.5–3 hours	Over 3 hours	R^2 (%)
12	56	55	50*	1
10	51	49	44**	1
8	42	40	37*	< 1
6	20	18	15**	2
5	72	69	64**	2

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 24 **ANOVA models for logical problem-solving age 5–12 by current TV watching**

Age	Under 1.5 hours	1.5–3 hours	Over 3 hours	R^{2+} (%)
12	71	70	70	< 1
10	62	61	60	< 1
8	48	47	48	< 1
6	57	53	55	< 1
5	65	62	59	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 25 **ANOVA models for mean cognitive composite scores age 5–12 by current TV watching**

Age	Under 1.5 hours	1.5–3 hours	Over 3 hours	R^2 (%)
12	62	60	57**	1
10	65	63	60**	1
8	55	54	50*	1
6	54	52	49*	1
5	64	61	57*	1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 26 **ANOVA models for mean attitudinal composite scores age 5–12 by current TV watching**

Age	Under 1.5 hours	1.5–3 hours	Over 3 hours	R^2 (%)
12	73	71	67***	2
10	73	70*	65****	4
8	70	68	65**	2
6	72	68*	66**	3
5	75	75	70*	3

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Current enjoyment of reading

Tables 27–31 give the mean scores (percentages) for the competencies at each year level across the three categories of current enjoyment of reading, and the adjusted R^2 (the proportion of the variance in the dependent variable explained by the model).

The probabilities indicated in the tables below are the probability that the score of the group that does enjoy reading or the group that enjoy it (with qualifications) is significantly different to that of the group that did not enjoy reading at age 14.

There are clear differences in mean competency between the groups, right from age 5. These differences tend to increase over time.

Table 27 **ANOVA models for mathematics/early number knowledge age 5–12 by current enjoyment of reading**

Age	No	Qualified yes	Yes	R^2 (%)
12	42	45	58****	8
10	52	60**	69****	9
8	52	62***	69****	8
6	71	75	81****	6
5	44	48	55***	5

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 28 **ANOVA models for PAT reading comprehension/word recognition/early literacy age 5–12 by current enjoyment of reading**

Age	No	Qualified yes	Yes	R^2 (%)
12	40	47*	63****	22
10	36	42*	58****	19
8	27	34**	47****	14
6	13	15	22****	11
5	63	66	74****	7

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 29 **ANOVA models for logical problem-solving age 5–12 by current enjoyment of reading**

Age	No	Qualified yes	Yes	R^2 (%)
12	64	69**	73****	8
10	55	59*	65****	10
8	43	46	49***	3
6	55	55	55	< 1
5	61	62	65	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 30 **ANOVA models for mean cognitive composite scores age 5–12 by current enjoyment of reading**

Age	No	Qualified yes	Yes	R^2 (%)
12	53	56*	65****	15
10	55	60**	68****	16
8	45	52**	58****	12
6	47	50	56****	7
5	56	59	65**	4

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 31 **ANOVA models for mean attitudinal composite scores age 5–12 by current enjoyment of reading**

Age	No	Qualified yes	Yes	R^2 (%)
12	63	70***	74****	8
10	65	68	73****	6
8	60	68****	71****	8
6	65	68	71**	4
5	70	74	75**	3

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Attendance

Tables 32–36 give the mean scores (percentages) for the competencies at each year level across the three categories of current attendance, and the adjusted R^2 (the proportion of the variance in the dependent variable explained by the model).

The probabilities indicated in the tables below are the probability that the score of the group that has a high rate of absence or the group that has a medium rate of absence is significantly different to that of the group that has a low rate of absence at age 14.

Despite very few of the results showing a significant difference between group means, there is a notable consistency in the difference across groups from age 5.

Table 32 **ANOVA models for mathematics/early number knowledge age 5–12 by current attendance**

Age	Low rate of absence	Medium rate of absence	High rate of absence	R^2 (%)
12	53	51	47	< 1
10	66	62	59	1
8	65	64	57*	1
6	78	77	71	1
5	52	51	46	<1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 33 **ANOVA models for PAT reading comprehension/word recognition/early literacy age 5–12 by current attendance**

Age	Low rate of absence	Medium rate of absence	High rate of absence	R^2 (%)
12	56	53	49	< 1
10	51	46*	48	1
8	41	39	36	< 1
6	19	19	16	< 1
5	70	70	64	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 34 **ANOVA models for logical problem-solving age 5–12 by current attendance**

Age	Low rate of absence	Medium rate of absence	High rate of absence	R^2 (%)
12	71	71	68	< 1
10	63	61	60	< 1
8	48	47	45	< 1
6	56	54	54	< 1
5	63	65	59	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 35 **ANOVA models for mean cognitive composite scores age 5–12 by current attendance**

Age	Low rate of absence	Medium rate of absence	High rate of absence	R^2 (%)
12	61	59	56*	1
10	65	63	61	1
8	55	53	50	< 1
6	53	52	49	< 1
5	62	62	56	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 36 **ANOVA models for mean attitudinal composite scores age 5–12 by current attendance**

Age	Low rate of absence	Medium rate of absence	High rate of absence	R^2 (%)
12	72	70	65**	2
10	71	69	66*	1
8	69	68	63*	1
6	69	72	66	1
5	74	74	71	< 1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Student leisure activities

Tables 37–40 give the mean scores (percentages) for the competencies at each year level across the four categories of student leisure activities, and the adjusted R^2 (the proportion of the variance in the dependent variable explained by the model).

The probabilities indicated in the tables below are the probability that the score of the other groups are significantly different to that of the group that plays computer games/has few interests at age 14.

Table 37 **ANOVA models for mathematics/early number knowledge age 5–12 by student leisure activities**

Age	Computer games	Plays sport	Reading/arts/sport	Creative interests	R^2 (%)
12	49	51	53	56	< 1
10	59	63	66**	66*	1
8	60	65	66*	63	< 1
6	76	76	80	78	< 1
5	46	49	57**	54	3

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 38 **ANOVA models for PAT reading comprehension/word recognition/early literacy age 5–12 by student leisure activities**

Age	Computer games	Plays sport	Reading/arts/sport	Creative interests	R^2 (%)
12	51	52	58*	61**	2
10	45	47	52**	57***	3
8	39	39	41	44	< 1
6	17	16	22**	20	3
5	63	68	75***	73*	5

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 39 **ANOVA models for logical problem solving age 5–12 by student leisure activities**

Age	Computer games	Plays sport	Reading/arts/sport	Creative interests	R^2 (%)
12	69	70	72*	73*	1
10	59	61	64**	65**	2
8	46	47	47	49	< 1
6	51	54	57*	58*	1
5	62	59	68	66	1

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

Table 40 **ANOVA models for mean attitudinal composite competency age 5–12 by student leisure activities**

Age	Computer games	Plays sport	Reading/arts/sport	Creative interests	R^2 (%)
12	66	71**	74****	72*	3
10	65	71**	73****	70*	4
8	66	66	70*	70*	2
6	66	68	74***	69	5
5	70	73	77***	76*	5

* 0.05 < p < 0.01 ** 0.01 < p < 0.001 *** 0.001 < p < 0.0001 **** p < 0.0001

5. Results: Research question 6

Research question 6: How are earlier competency levels in social skills, parental and teacher reports of attitude to school and relevant school behaviour, from age 6 on, related to relations with peers at age 14 both in and out of school, experience of bullying, and risk behaviours?

To answer this question we took a set of our factor scale variables (see Section 2) as explanatory variables:

- Mean attitudinal competencies age 6–12
- Teacher opinions of child's character (good/organised; individualistic; introvert; extrovert; difficult), based on teacher responses age 8–12

as well as two of the cluster variables defined (see Section 2). The reference group for each cluster is italicised:

- Teacher value clusters at 12 (*good/organised*, individualistic, introvert, extrovert, difficult), used in some models as an alternative to the five corresponding scores (see above)
- Values (clusters: anchored/achieving, anchored, *standing out*)

We also used ten "history factors", summarising the students' experiences:

- The number of times a student had experienced a major upset in their lives, and how well they coped with this (*no upsets*; one upset, but student coping; mixed experiences, but student coping; student upset and did not cope once aged 10–14; student upset and did not cope at 8 or upset and did not cope twice or more aged 10–14)
- The number of schools attended
- Number of times moved house since birth of the student
- History of TV watching, based on the number of hours of TV watched (*mainly low level of watching*; mixed; mainly high levels of watching)
- History of enjoyment of reading (based on reports by parents in early years, later by students themselves: *responses all "yes"*; mainly "yes" or "qualified yes"; mixed responses; two to four "no" responses)
- History of number of parental concerns mentioned at ages 12 and 14 (*none*; two at 14; greater concern expressed at 12 than at 14; three or more at 14)
- History of family stability (*mostly sole parent*; mostly 2 parent (birth); mostly 2 parent (1 step); mostly 2 parent (mixed); mixed)
- History of how the student felt about school (*always enthusiastic*; fairly enthusiastic; mixed; unhappy one or more times)
- Historical patterns of bullying (has been involved in bullying; has had at least 2 possible incidents of bullying reported; *has had no involvement in bullying*)
- History of the parent/s working with teachers on problem/s (*never*; once; twice; three or four times; each round of data collection).

We investigated how much of the variation in scale variables about friendships the variables listed above could explain. The "outcome" variables we used were:

- Solid friendships (student feels friends listen to them, respect them, are trustworthy, are liked by their parents, etc.)
- Friends with risky behaviour (friends smoke, drink alcohol or marijuana, wag school, get into trouble at school, have sex)
- Risky behaviour (student has drunk alcohol and/or done something they regretted while drunk, got in trouble with the police, had sex, been in a fight, got into trouble at school, etc.)

and we also explored the extent to which current involvement in bullying at age 14 could be explained by or was associated with the explanatory variables.

Friendship factors

Friends with risky behaviour

There were weak correlations between friends with risky behaviour and seventeen of the explanatory variables. These variables are listed in Table 41. The variables with positive correlation coefficients have higher values of the variable associated with higher scores for friends having risky behaviour, while those with negative correlation coefficients have higher values of the variable associated with lower scores for friends having risky behaviour.

Table 41 **Variables correlated with friends with risky behaviour scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
		Individual responsibility age 12	0.29
		Mean attitudinal composite age 12	0.26
		Perseverance age 12	0.25
Difficult	0.22	Social skills with teachers age 12	0.22
		Individual responsibility age 10	0.21
		Good/organised 8–12	0.20
		Perseverance age 8	0.18
		Social skills with peers age 12	0.16
		Individual responsibility age 8	0.15
Peer social-emotional 5	0.14	Mean attitudinal composite age 10	0.14
		Social skills with peers age 10	0.14
		Peer social and emotional age 5	0.14
		Introvert*	0.14
		Social skills with peers age 8	0.13
		Mean attitudinal composite age 8	0.13

*Variables included in model below

Family income at 14, rather than family income at 5 or maternal qualifications, accounted for a significant amount of the variation in the friends with risky behaviour score. One-way ANOVA models were fitted for each of the cluster and history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 was added to the model.

- History of the number of parental concerns ($p = 0.0017$, $R^2 = 3$ percent)
- History of TV watching ($p = 0.0025$, $R^2 = 2$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 5$ percent)
- History of involvement in bullying ($p = 0.0005$, $R^2 = 3$ percent)
- Student values clusters ($p = 0.0010$, $R^2 = 3$ percent)

Of the above, the cluster and history variables that were still significant in the larger model were history of parental concerns, history of bullying, history of enjoyment of reading, and students' values. The boxplots in Figure 1 and Figure 2 show the differences for all the history and cluster variables.

Figure 1 **Friends risky behaviour scores for six family variables**

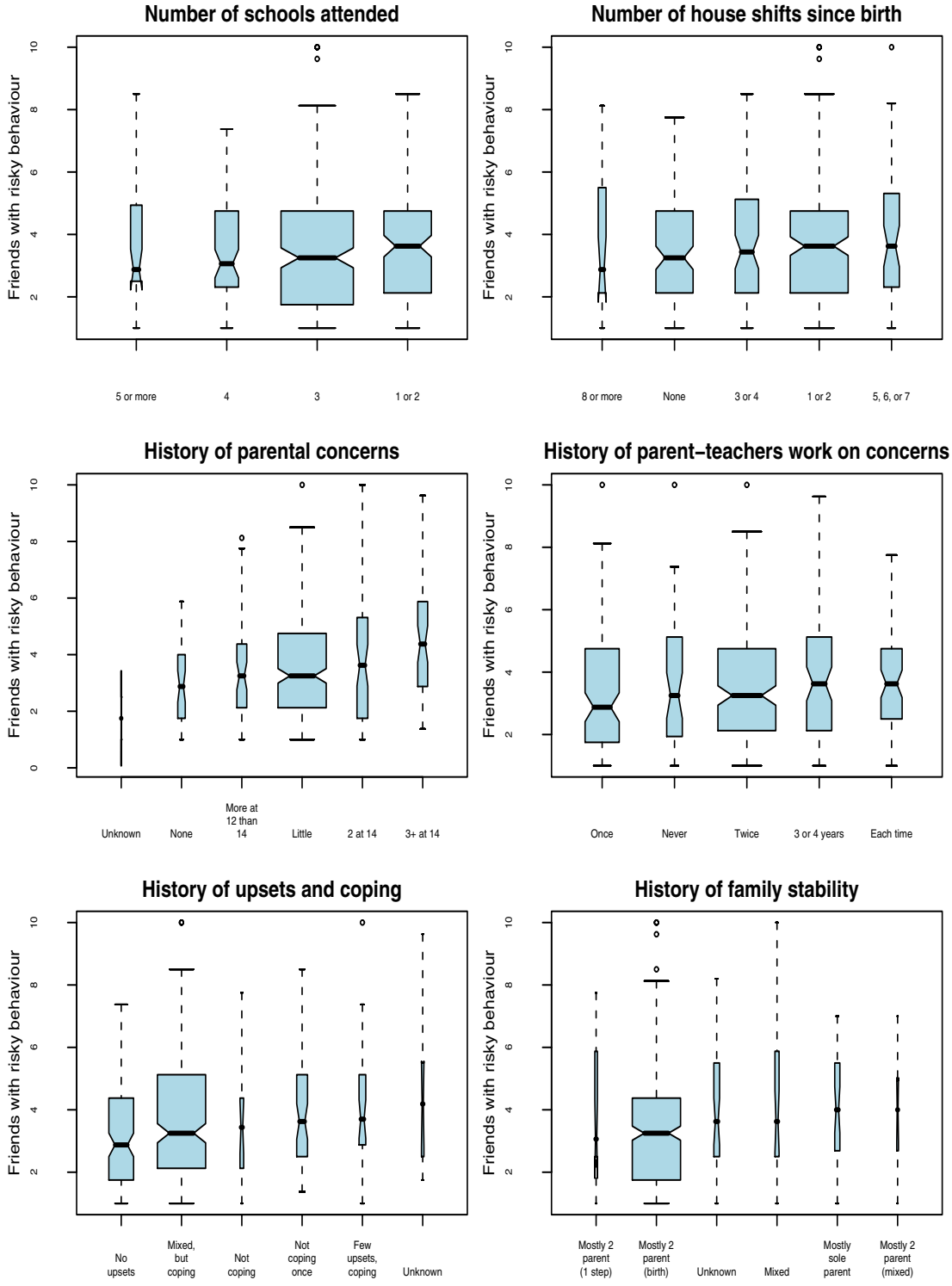
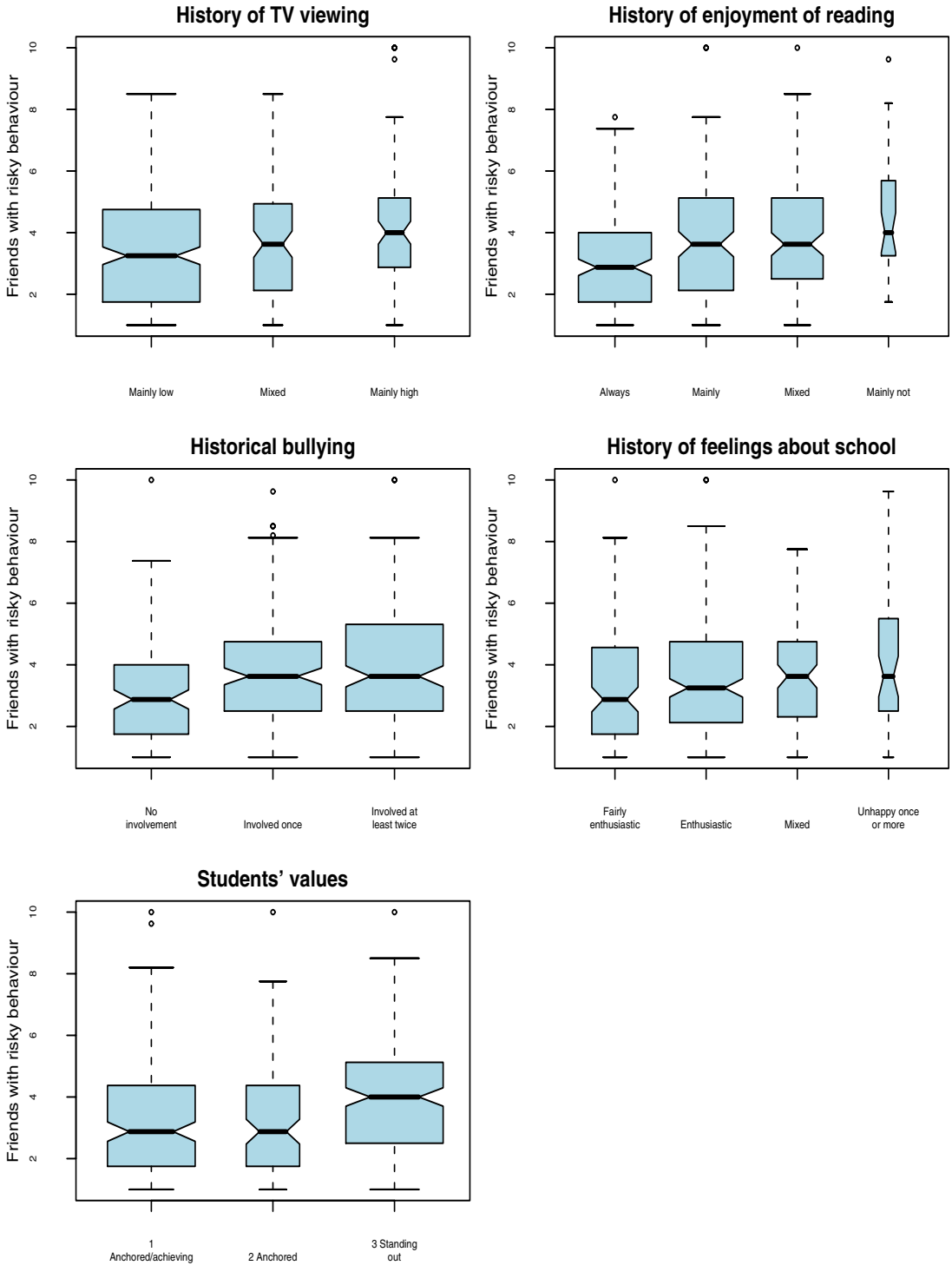


Figure 2 **Friends risky behaviour scores for five student variables**



Ten percent of the variability in the friends with risky behaviour score was explained by introvert score, students' values, history of parental concerns, history of bullying, and history of enjoyment of reading.

The model is shown in Table 42.

Table 42 **Model for friends with risky behaviour scores**

Explanatory variables	Regression coefficient	Standard error	*p*-value
Scale variables			
Introvert	-0.23	0.07	0.0015
History and cluster variables			
History of enjoyment of reading			0.0084
Mainly yes/qualified yes	0.51	0.21	0.0150
Mixed responses	0.52	0.22	0.0177
Two or more no	0.98	0.34	0.0045
History of bullying			0.0273
Been involved in bullying once	0.41	0.21	0.0494
Has had at least 2 possible incidents of bullying reported	0.56	0.21	0.0086
Student values			0.0513
Anchored	-0.07	0.22	0.7346
Standing out	0.39	0.19	0.0427
History of parental concerns			0.0572
Unknown number	-1.78	1.29	0.1682
Greater concern expressed at 12 than at 14	-0.01	0.37	0.9884
Few concerns	0.31	0.30	0.3058
Two at age 14	0.49	0.37	0.1858
Three or more at age 14	0.85	0.38	0.0271

When maternal qualifications and family income were added to the model above, family income at age 14 contributed significantly to the model (p = 0.0264), and history of parental concerns was no longer significant.

Risky behaviour

There were weak correlations between risky behaviour and 16 of the explanatory variables. These variables are listed in Table 43.

Table 43 **Variables correlated with risky behaviour scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
		Individual responsibility age 12	0.29
		Mean attitudinal composite age 12	0.24
Difficult*	0.23	Perseverance age 12*	0.23
		Good/organised 8–12*	0.25
		Social skills with peers age 12	0.21
		Individual responsibility age 8	0.20
		Perseverance age 8	0.18
		Individual responsibility age 10	0.18
		Mean attitudinal composite age 8	0.15
		Social skills with teachers age 12	0.14
		Social skills with peers age 8	0.14
		Perseverance age 10	0.13
		Curiosity age 12	0.13
		Social skills with adults age 8	0.13
		Introvert	0.12

* Variables included in model below

Family income at 14, rather than family income at 5 or maternal qualifications, accounted for a significant amount of the variation in the risky behaviour score. One-way ANOVA models were fitted for each of the cluster and history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 was added to the model.

- History of the number of parental concerns ($p = 0.0002$, $R^2 = 4$ percent)
- History of family stability ($p = 0.0296$, $R^2 = 2$ percent); not significant if family income at 14 is added to the model
- History of TV watching ($p = 0.0429$, $R^2 = 1$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 9$ percent)
- History of involvement in bullying ($p < 0.0001$, $R^2 = 5$ percent)
- Student values clusters ($p = 0.0002$, $R^2 = 3$ percent)

Of the above, the cluster and history variables that were still significant in the larger model were history of parental concerns, history of bullying, and history of enjoyment of reading. The boxplots in Figure 3 and Figure 4 show the differences for all the history and cluster variables.

Figure 3 **Risky behaviour scores for history groupings of six family variables**

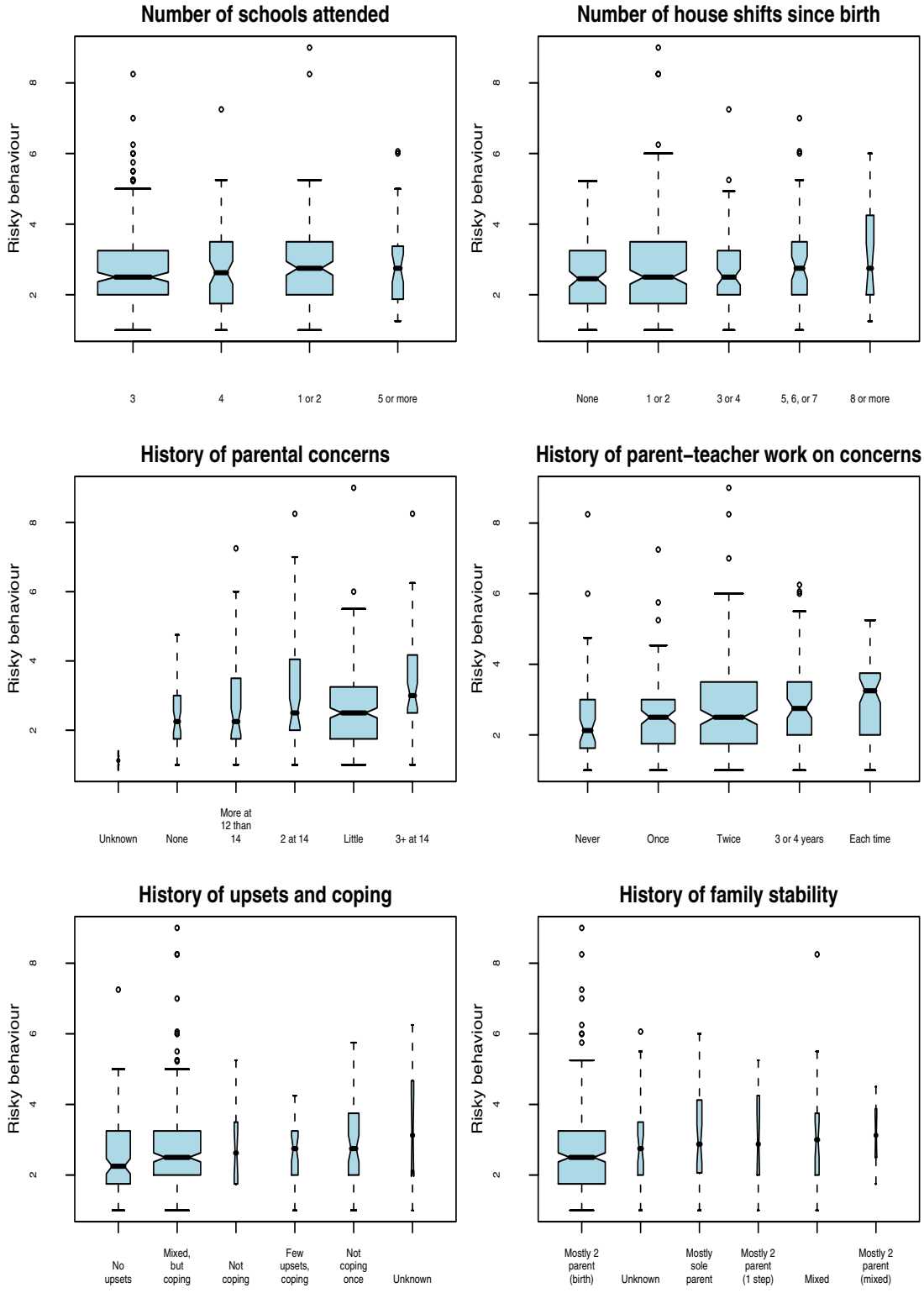
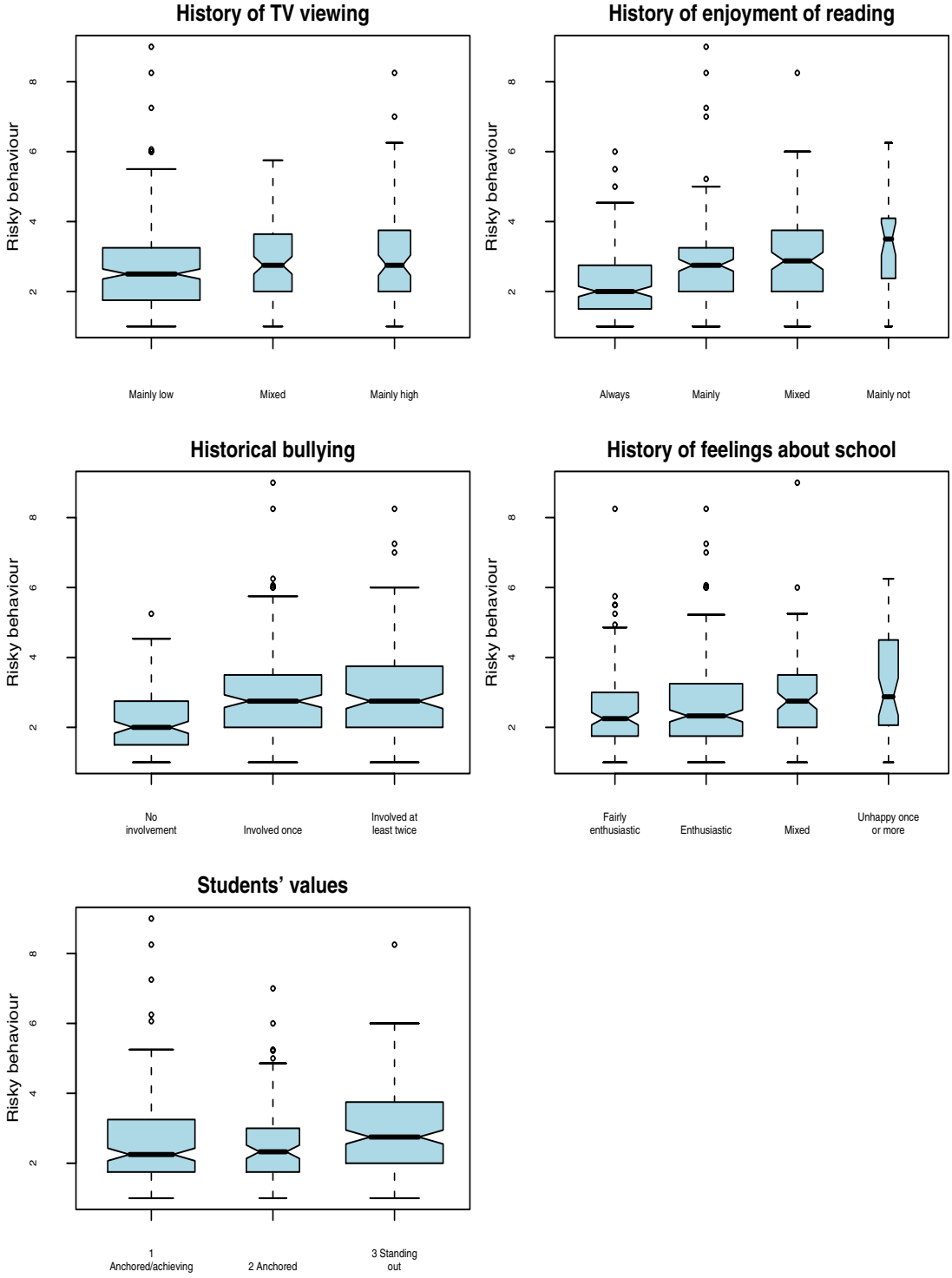


Figure 4 **Risky behaviour scores for history or cluster groupings of five student variables**



The explanatory variables accounted for 15 percent of the variability in the risky behaviour score. The statistically significant explanatory variables are given in Table 44. The variable making the largest contribution to the risky behaviour score was history of enjoyment of reading; less enjoyment of reading was associated with more risky behaviour.

Table 44 **Model for risky behaviour**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Perseverance 12	-0.06	0.03	0.0497
Good/organised 8–12	-0.07	0.04	0.0591
History/Cluster variables			
History of enjoyment of reading			0.0001
Mainly yes or qualified yes	0.43	0.13	0.0013
Mixed responses	0.58	0.14	< 0.0001
Mainly no	0.58	0.23	0.0136
History of number of parental concerns			0.0187[a]
Unknown	-1.69	0.83	0.0429
Greater concern expressed at 12 than at 14	-0.21	0.24	0.3927
Few concerns	-0.02	0.20	0.9281
Two at age 14	0.12	0.24	0.6227
Three or more at age 14	0.42	0.25	0.0888
History of bullying			0.0249
Been involved once	0.31	0.14	0.0223
Been involved at least twice	0.36	0.14	0.0114

[a] The statistically significant differences were between greater concern expressed at 12 than at 14 and three or more concerns at age 14.

When maternal qualifications and family income were added to the model, family income at 14 contributed significantly to the model ($p = 0.0034$), and being good/organised was no longer significant.

As can be seen from the boxplots, the distribution of the risky behaviour score is very skew, and the residual plots for the model above indicated that the assumptions on which the tests were based were not all met. To confirm the conclusions, the risky behaviour score was dichotomised (63 students showed evidence of risky behaviour, and 410 did not) and logistic regression models were fitted, much as the linear models had been fitted to the scores. Similar results were obtained, but are not reported here (the aim was to confirm the results from the linear model, which is reported for consistency with the results for other outcome variables).

Solid friendships

There were weak correlations between the solid friendships score and 17 of the explanatory variables. These variables are listed in Table 45.

Table 45 **Variables correlated with solid friendships scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Individual responsibility age 8	0.18		
Individual responsibility age 10	0.18		
Social skills with peers age 10	0.18		
Social skills with adults age 8	0.17		
Mean attitudinal composite age 10	0.16	Individualistic	0.16
Individual responsibility age 12	0.16		
Social skills with teachers age 12*	0.16		
Mean attitudinal composite age 12	0.15	Communication age 5	0.15
Mean attitudinal composite age 8	0.15		
Social skills with teachers age 10	0.14		
Perseverance age 12	0.14		
Perseverance age 8	0.13	Perseverance age 5	0.13
Good/organised 8–12	0.13	Adult social-emotional 5	0.13

* Variables included in model below

None of family income at 14, family income at 5 nor maternal qualifications, accounted for a significant amount of the variation in the solid friendships score. One-way ANOVA models were fitted for each of the cluster and history variables in turn, and those that were statistically significant are listed below. They were, of course, still significant after family income at 14 and maternal qualifications were added to the model.

- History of the number of parental concerns ($p = 0.0374$, $R^2 = 1$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 4$ percent)
- History of involvement in bullying ($p = 0.0056$, $R^2 = 2$ percent)
- Student values clusters ($p = 0.0352$, $R^2 = 1$ percent)

Of the above, the cluster and history variables that were still significant in the larger model were history of bullying, and history of enjoyment of reading. The boxplots in Figure 5 and Figure 6 show the differences for all the history and cluster variables.

Figure 5 **Solid friendships scores for history groupings of six family variables**

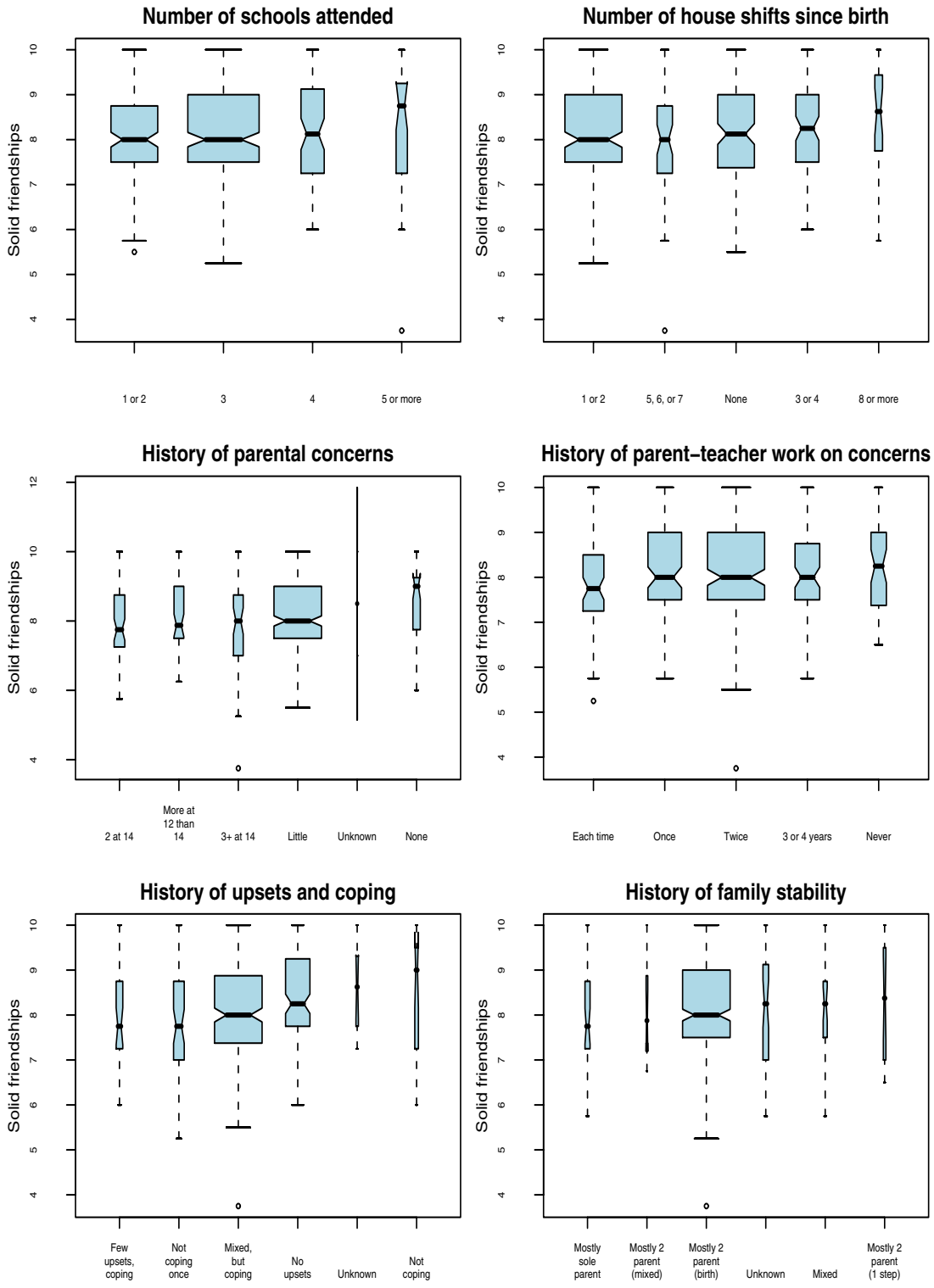
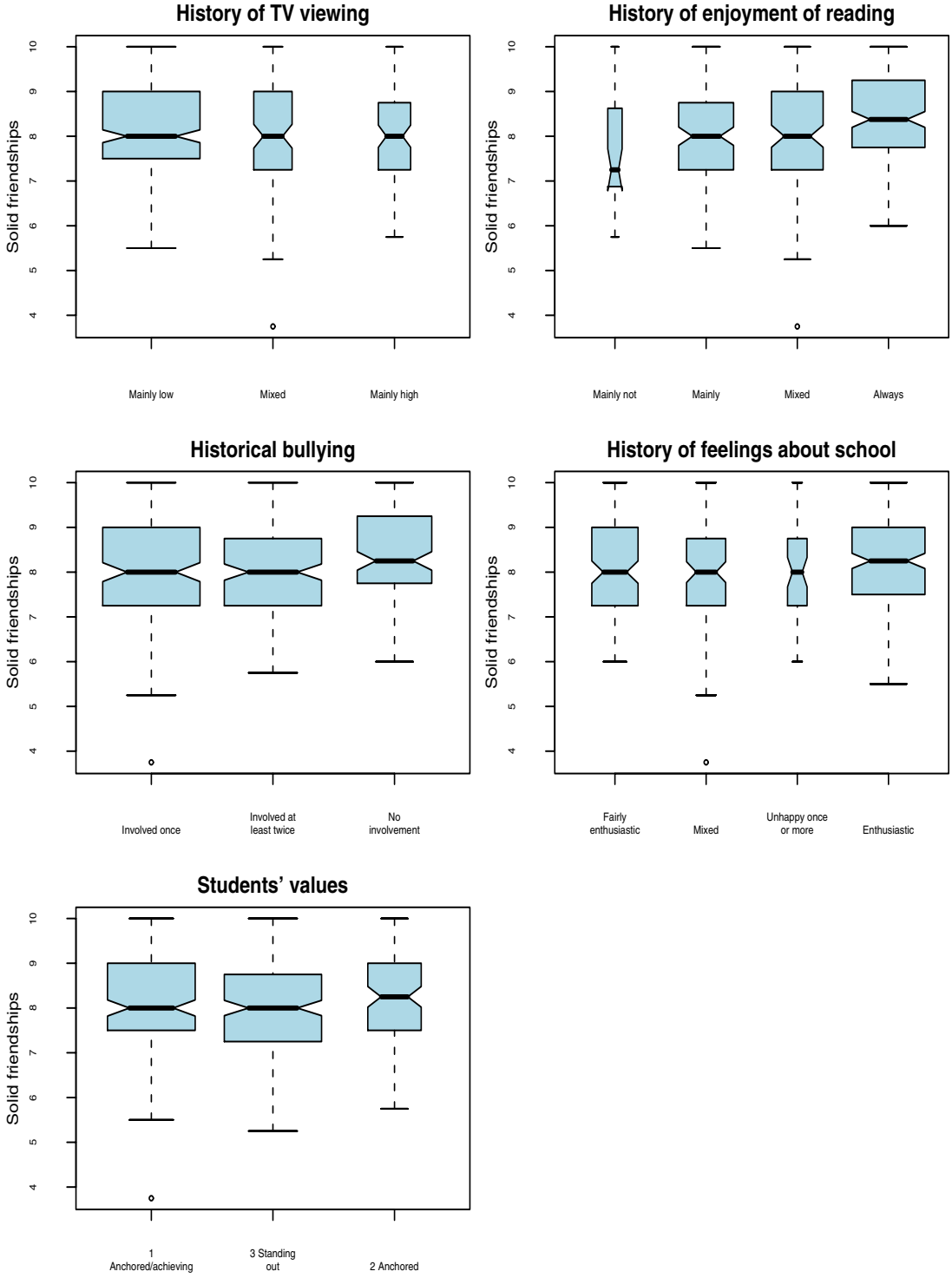


Figure 6 **Solid friendships scores for history or cluster groupings of five student variables**



The explanatory variables accounted for six percent of the variability in solid friendships scores. The statistically significant explanatory variables are given in Table 46. The variable making the largest contribution to the solid friendships score was history of enjoyment of reading.

Table 46 **Model for solid friendships**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Social skills with teachers 12	0.07	0.03	0.0214
History variables			
History of enjoyment of reading			0.0087
Mainly yes or qualified yes	-0.31	0.12	0.0111
Mixed responses	-0.33	0.13	0.0096
Two or more no	-0.54	0.20	0.0076
History of bullying			0.0723
Been involved once	-0.27	0.12	0.0276
Been involved at least twice	-0.22	0.13	0.0735

When maternal qualifications and family income were added to the model, neither added significantly to the model.

Current involvement in bullying

Attempts to use classification trees or linear discriminant analysis models to describe current bullying involvement were not successful. Cross-tabulations and chi-square tests were used to explore the relationship between current involvement in bullying and the history factors. The data indicated associations between:

- **History of involvement in bullying**: all of those who had never bullied or been bullied reported no current involvement in bullying; 78 percent of those who had reported a single instance previously reported no involvement at age 14; and 47 percent of those who had reported incidences least twice in the past reported no current involvement. of those who had reported incidences least twice in the past, a quarter reported being a victim, 12 percent being a victim and a bully, and 16 percent being a bully at age 14.
- **History of feelings about school**: of those who reported being enthusiastic, fairly enthusiastic, or gave mixed reports, about three quarters reported no current involvement in bullying, compared with 52 percent of those whose parents had reported that they were unhappy at least once.
- **History of parents and teachers working to resolve concerns**: Eighty-three percent of those whose parents never reported having worked with teachers to resolve concerns reported no current involvement in bullying. This percentage decreased with increasing number of times that the parents and worked on concerns to 68 percent of those whose parents had each time reported working with teachers to resolve concerns.

To investigate the relationship between current involvement in bullying and earlier competencies or factor scores, we divided the scores into quartile groups, and cross-tabulated these groups against current bullying. The only score that showed a statistically significant association was the mean attitudinal composite at age 12. Current non-involvement in bullying was least likely in the lowest score group (66 percent), and increased to 77 percent in the highest score group. The quartile group with the highest reported rate of being a bully (18 percent) was the lowest score group, and that with the lowest rate (four percent) was the highest score group. The rates of being a victim ran in the opposite direction, from 10 percent of the lowest score group to 14 percent in the highest score group.

6. Results: Research question 7

Research question 7: How are earlier competency levels in perseverance, communication, and individual responsibility, parent and teacher reports of dispositions and ability to cope with problems, related to competency levels at age 14 and attitudes to school, including motivation, attendance, and engagement?

To answer this question we took a set of our factor scale variables (see Section 2) as explanatory variables:

- Mean attitudinal competencies age 6–12
- Teacher opinions of student's character (good/organised; individualistic; introvert; extrovert; difficult), based on teacher responses age 8–12

as well as two of the cluster variables defined (see Section 2). The reference group for each cluster is italicised:

- Teacher value clusters at 12 (*good/organised*, individualistic, introvert, extrovert, difficult), used in some models as an alternative to the five corresponding scores (see above)
- Values (clusters: anchored/achieving, anchored, *standing out*)

We also used six "history variables", summarising the students' experiences:

- The number of times a student had experienced a major upset in their lives, and how well they coped with this (*no upsets*; one upset, but student coping; mixed experiences, but student coping; student upset and did not cope once aged 10–14; student upset and did not cope at 8 or upset and did not cope twice or more aged 10–14)
- History of enjoyment of reading (based on reports by parents in early years, later by students themselves: *responses all "yes"*; mainly "yes" or "qualified yes"; mixed responses; two to four "no" responses)
- History of number of parental concerns mentioned at ages 12 and 14 (*none*; two at 14; greater concern expressed at 12 than at 14; three or more at 14)
- History of how the student felt about school (*always enthusiastic*; fairly enthusiastic; mixed; unhappy one or more times)
- Historical patterns of bullying (has been involved in bullying, has had at least 2 possible incidents of bullying reported, *has had no involvement in bullying*)
- History of TV watching, based on the number of hours of TV watched (*mainly low level of watching*; mixed; mainly high levels of watching)
- History of the parent/s working with teachers on problem/s (*never*; once; twice; three or four times; each round of data collection).

We investigated how much of the variation in cognitive competencies at age 14 and scale variables about attitude to school, including engagement and confidence in school, the variables listed above could explain. The "outcome" variables we used were:

- Positive attitude to English, Mathematics, or Science teacher (student likes them, thinks they are fair and understand student feelings)
- Positive learning environment in English, Mathematics or Science (student feels the teacher gives clear instructions and expectations, is helpful, is interested in the students, etc)
- Disrupted learning environment (students don't listen to the teacher, behave distractingly, and the class is interrupted)
- Negative about English, Mathematics and Science (student plans to drop the subject, doesn't know how to do the work, and does not do well)

- External markers (student measures progress at school by the extent to which they out-perform others)
- Internal markers (student measures progress at school by having worked a problem out, learning interesting things, understanding and thinking about things, doing their best)
- Absorbed in learning (student gets totally absorbed in their work, checks their work, work out problems in group, works with understanding, etc.)
- Confident in school (student feels they are treated as an individual, feel they belong and are safe, etc.)
- Engaged in school (student likes teachers and enjoys learning, feels the rules are fair, etc.)
- Disengaged in learning (student misbehaves in class, puts in minimal effort, etc.)
- Parental perceptions of the students' self-efficacy (student takes responsibility for actions, meets personal goals, gets on well with peers, shows respect for adults, etc.)
- Parental perceptions of students' self-confidence (student enjoys new experiences/challenges, interacts confidently with adults, asks a lot of questions, clearly explains what they have seen/done, etc)
- Parental perceptions of students' responsibility (student remembers and carries out instructions if told once, takes responsibility for getting organised, passes on messages accurately, finishes all chores, etc)
- Cognitive competency at age 14: the overall mean measure, and the three separate measures for reading comprehension, mathematics and logical problem-solving
- Attitudinal competency at age 14

We also explored the extent to which the explanatory variables were associated with absence from school at age 14 and motivation (clusters: university/professional orientation, high faith in gains from school; less positive of gains from school and less sure of future goals; aiming for skilled/unskilled jobs, low conviction about gains from school).

Competencies at age 14

Mean cognitive composite score

There were weak to moderate correlations between the mean cognitive composite score at 14 and 33 of the explanatory variables. These variables are listed in Table 47. The variables with positive correlation coefficients have higher values of the variable associated with higher mean cognitive composite scores, while those with negative correlation coefficients have higher values of the variable associated with lower mean cognitive composite scores.

Table 47 **Variables correlated with mean cognitive composite scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Communication age 6	0.49		
Perseverance age 8*	0.47		
Mean attitudinal composite age 12*	0.47		
Mean attitudinal composite age 10	0.47		
Mean attitudinal composite age 8	0.47		
Perseverance age 6	0.46		
Perseverance age 12	0.45		
Perseverance age 10*	0.45		
Individual responsibility age 8	0.44		
Curiosity age 12	0.44		
Individual responsibility age 10	0.39		
Good/organised	0.34	Difficult	0.34
Social skills with teachers age 10	0.34		
Social skills with adults age 6	0.34		
Peer social-emotional age 5	0.34		
Social skills with peers age 6	0.32		
Perseverance age 5	0.32		
Social skills with adults age 8	0.31		
Individual responsibility age 12	0.30		
Social skills with peers age 8	0.30		
Social skills with teachers age 12	0.29		
Social skills with peers age 10	0.28		
Communication age 5	0.28		
Inquisitiveness age 5	0.28		
Self social-emotional age 5	0.25		
Curiosity age 10	0.24		
Extrovert	0.23		
Curiosity age 8	0.22		
Social skills with peers age 12	0.22		
Adult social-emotional age 5	0.20		
Inquisitiveness age 5	0.18		
Individualistic	0.13		

* Variables included in model below

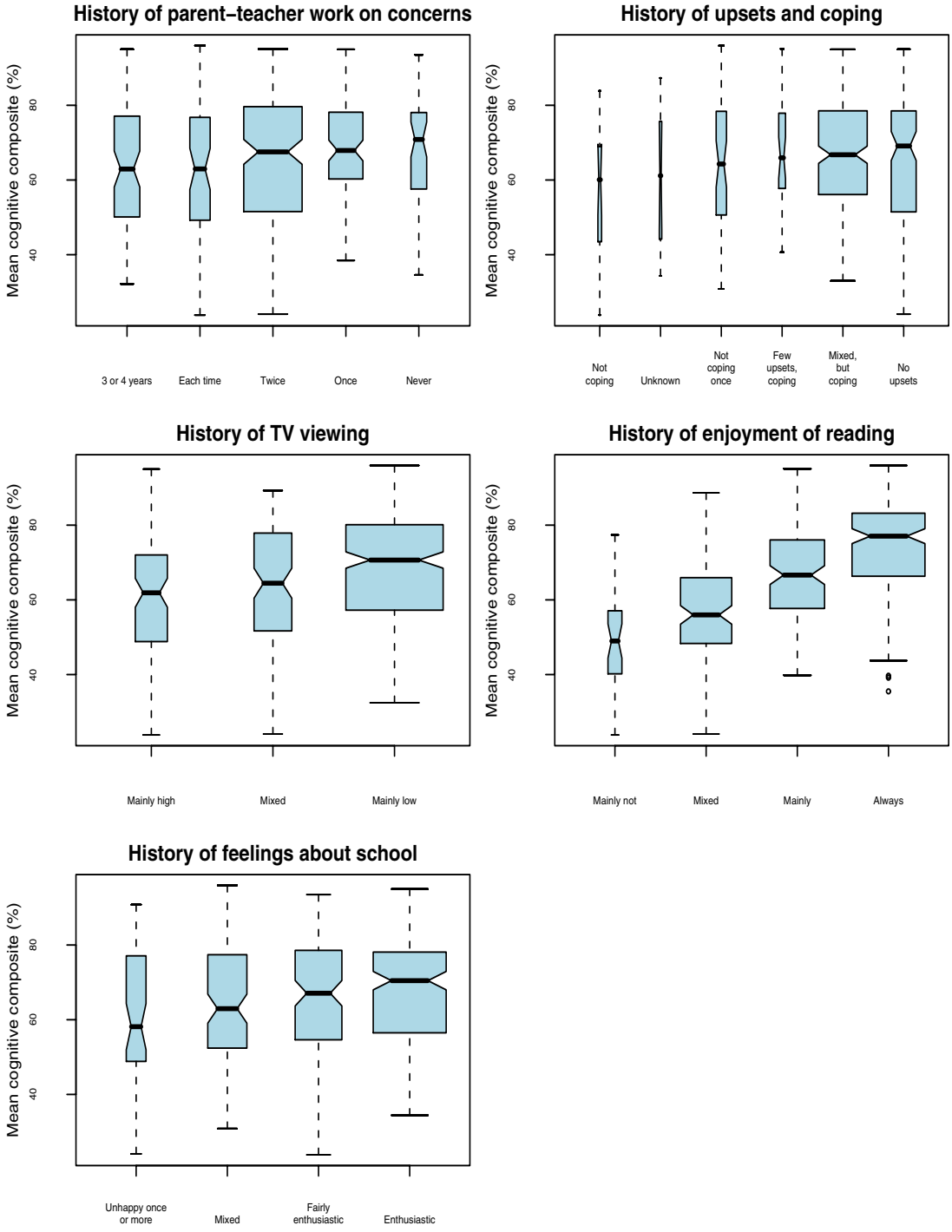
Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the mean cognitive competency score, although the models fitted with family income at age 5 accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise

stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- History of TV watching ($p < 0.0001$, $R^2 = 4$ percent); no longer significant when maternal qualifications and family income at age 5 were added to the model
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 27$ percent)
- History of feelings about school ($p = 0.0138$, $R^2 = 2$ percent)

History of enjoyment of reading was still significant in the larger model (Table 48). The boxplots in Figure 7 show the differences for all the history variables.

Figure 7 **Mean cognitive competency scores for five history variables**



Forty-two percent of the variability in the mean cognitive competency score was explained by perseverance scores at 8 and 10, the mean attitudinal composite competency score at 12, and history of enjoyment of reading.

The model is shown in Table 48.

Table 48 **Model for mean cognitive competency scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Perseverance 8	0.13	0.03	< 0.0001
Perseverance 10	0.15	0.03	< 0.0001
Mean attitudinal composite 12	0.18	0.04	< 0.0001
History variable			
History of enjoyment of reading			< 0.0001
Mainly yes/qualified yes	-0.55	0.13	< 0.0001
Mixed responses	-1.21	0.14	< 0.0001
Two or more no	-1.37	0.23	< 0.0001

When maternal qualifications and family income scores were added to the model above, both contributed significantly to the model ($p < 0.0001$ and $p = 0.0078$, respectively), and the model accounted for 51 percent of the variability in mean cognitive competency score.

Mathematics 14

There were weak to moderate correlations between mathematics scores at 14 and 33 of the explanatory variables. These variables are listed in Table 49.

Table 49 **Variables correlated with mathematics 14 scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Communication age 6	0.47		
Perseverance age 8*	0.45		
Mean attitudinal composite age 8	0.44		
Mean attitudinal composite age 12	0.43		
Curiosity age 12	0.43		
Perseverance age 6	0.43		
Perseverance age 12*	0.42		
Perseverance age 10*	0.41		
Mean attitudinal composite age 10	0.41		
Individual responsibility age 8	0.40		
Individual responsibility age 10	0.32		
Good/organised*	0.30	Difficult	0.30
Social skills with adults age 8	0.30		
Social skills with peers age 6	0.30		
Peer social-emotional age 5	0.30		
Social skills with adults age 6	0.30		
Social skills with teachers age 10	0.29		
Perseverance age 5	0.29		
Individual responsibility age 12*	0.27		
Inquisitiveness age 6	0.27		
Social skills with peers age 10	0.26		
Social skills with peers age 8	0.25		
Social skills with teachers age 12	0.25		
Curiosity age 8	0.23		
Self social-emotional age 5	0.22		
Communication age 5	0.22		
Curiosity age 10	0.21		
Social skills with peers age 12	0.20		
Extrovert	0.19		
Inquisitiveness age 5	0.15		
Adult social-emotional age 5	0.13		
Individualistic	0.13		

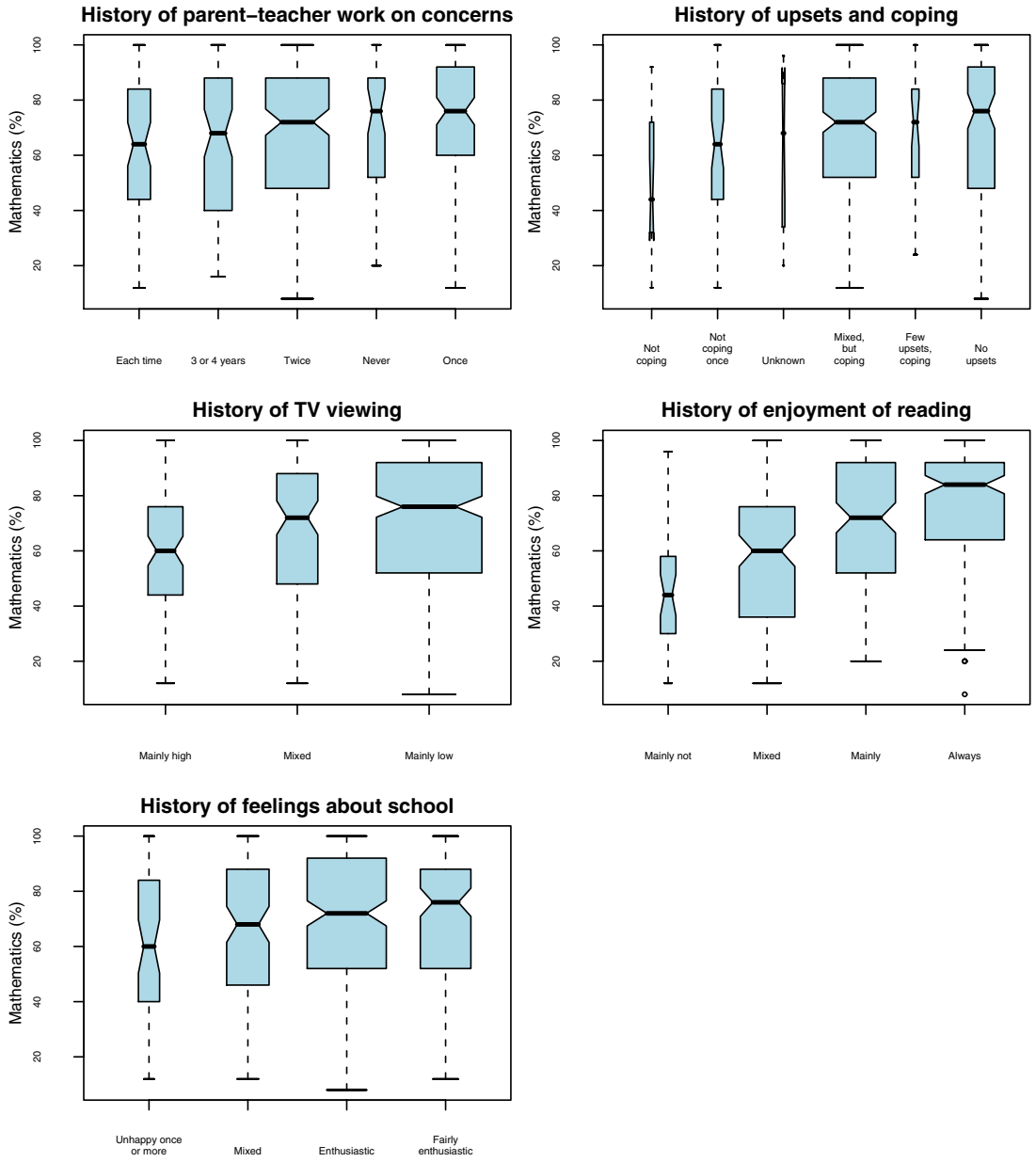
*Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the mathematics score, although the models fitted with family income at age 5 accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- History of parent/s and teachers working on concerns ($p = 0.0152$, $R^2 = 2$ percent)
- History of upsets and coping with them ($p = 0.0115$, $R^2 = 2$ percent); no longer significant when maternal qualifications and income at age 5 were added to the model
- History of TV watching ($p = 0.0009$, $R^2 = 3$ percent); no longer significant when maternal qualifications and family income at age 5 were added to the model
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 16$ percent)
- History of feelings about school ($p = 0.0424$, $R^2 = 1$ percent)

History of enjoyment of reading was still significant in the larger model (Table 50). The boxplots in Figure 8 show the differences for all the history variables.

Figure 8 **Mathematics scores for five history variables**



Thirty-seven percent of the variability in the mathematics score was explained by perseverance scores at 8 and 10, the score for the teachers' opinion that the students were individualistic, curiosity at age 12, and history of enjoyment of reading.

The model is shown in Table 50.

Table 50 **Model for mathematics scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Perseverance 8	0.24	0.05	< 0.0001
Perseverance 10	0.21	0.05	< 0.0001
Curiosity 12	0.32	0.05	< 0.0001
Individualistic	0.24	0.10	0.0204
History variable			
History of enjoyment of reading			< 0.0001
Mainly yes/qualified yes	-0.36	0.22	0.1014
Mixed responses	-1.24	0.23	< 0.0001
Two or more no	-1.36	0.38	0.0004

When maternal qualifications and family income scores were added to the model above, both contributed significantly to the model ($p < 0.0001$ and $p = 0.0057$, respectively), the model accounted for 44 percent of the variability in mathematics score, and the individualistic score was no longer statistically significant in the model.

PAT reading comprehension

There were weak to moderate correlations between the PAT reading comprehension scores and 32 of the explanatory variables. These variables are listed in Table 51.

Table 51 **Variables correlated with PAT reading comprehension scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Mean attitudinal composite age 10	0.44		
Mean attitudinal composite age 8	0.44		
Individual responsibility age 8*	0.43		
Perseverance age 8	0.43		
Mean attitudinal composite age 12*	0.42		
Perseverance age 12	0.40		
Communication age 6	0.40		
Perseverance age 10*	0.39		
Curiosity age 12	0.39		
Perseverance age 6	0.38		
Individual responsibility age 10	0.37		
Social skills with teachers age 10	0.33		
Social skills with adults	0.32		
Good/organised	0.31		
Social skills with adults age 8	0.31	Difficult	0.32
Social skills with peers age 6	0.31		
Social skills with peers age 8	0.29		
Peer social-emotional age 5	0.29		
Communication age 5	0.28		
Individual responsibility age 12	0.27		
Perseverance age 5	0.27		
Social skills with peers age 10	0.26		
Inquisitiveness age 6	0.26		
Social skills with teachers age 12	0.25		
Self social-emotional age 5	0.25		
Curiosity age 10	0.24		
Adult social-emotional age 5	0.23		
Extrovert	0.21		
Social skills with peers age 12	0.20		
Curiosity age 8	0.20		
Inquisitiveness age 5	0.15		

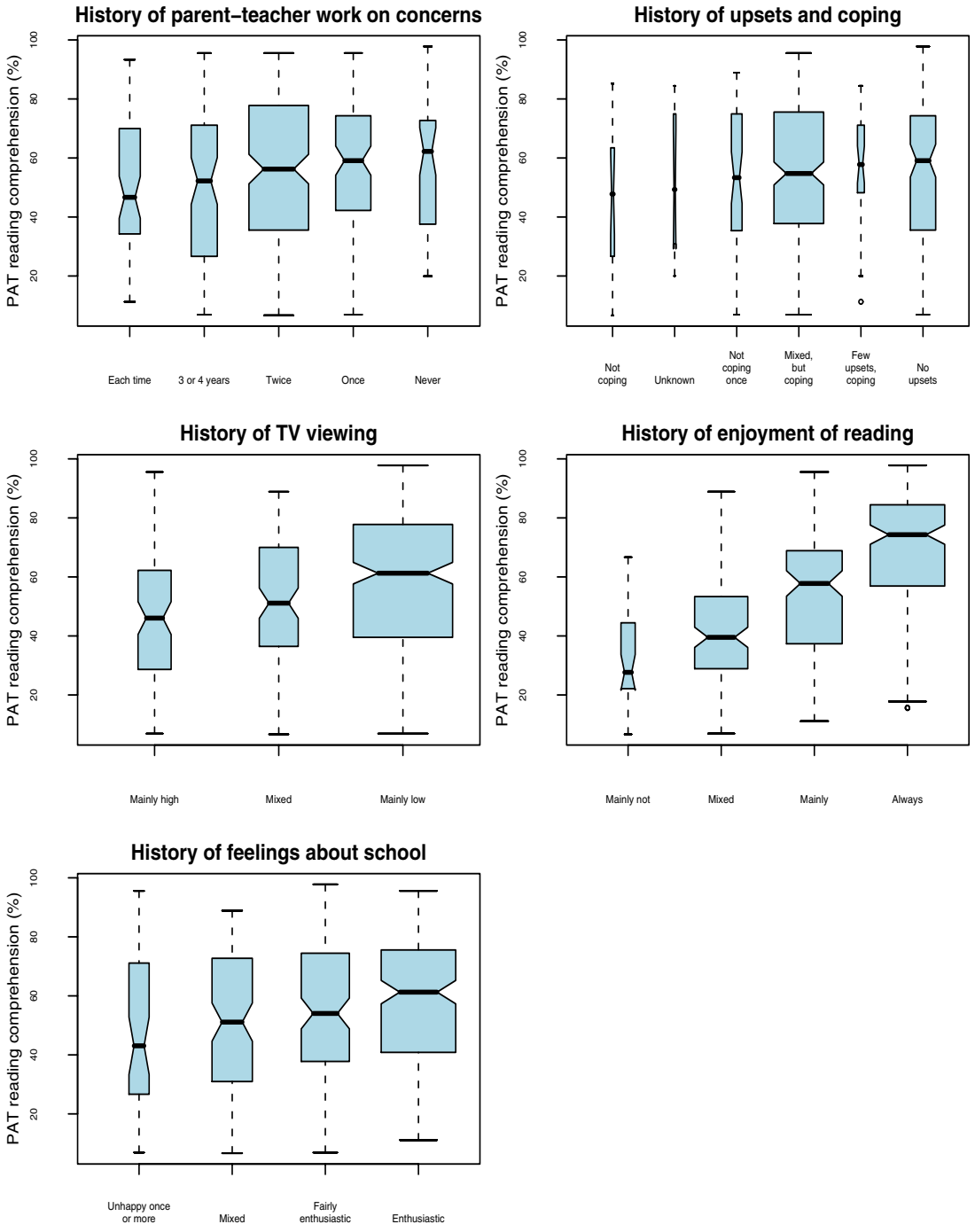
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the PAT reading comprehension score, although the models fitted with family income at age 5 accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- History of TV watching ($p < 0.0001$, $R^2 = 4$ percent); no longer significant when maternal qualifications and family income at age 5 were added to the model
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 31$ percent)
- History of feelings about school ($p = 0.0391$, $R^2 = 1$ percent)

History of enjoyment of reading was still significant in the larger model (Table 52). The boxplots in Figure 9 show the differences for all the history variables.

Figure 9 **PAT reading comprehension scores for history groupings of five variables**



The explanatory variables accounted for 40 percent of the variability in PAT reading comprehension scores. The statistically significant explanatory variables are given in Table 52.

Table 52 **Model for PAT reading comprehension score**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Individual responsibility 8	0.18	0.05	0.0004
Perseverance 10	0.17	0.05	0.0005
Mean attitudinal composite score 12	0.20	0.07	0.0026
History variables			
History of enjoyment of reading			< 0.0001
Mainly yes or qualified yes	-1.19	0.20	< 0.0001
Mixed responses	-2.20	0.21	< 0.0001
Two or more no	-2.34	0.36	< 0.0001

When maternal qualifications and family income at 14 were added to the model, both added significantly to the model ($p < 0.0001$ and 0.0015, respectively). The model accounted for 48 percent of the variability in PAT reading comprehension.

Logical problem solving

There were weak to moderate correlations between the logical problem solving scores and 33 of the explanatory variables. These variables are listed in Table 53.

Table 53 **Variables correlated with logical problem solving scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Communication age 6	0.41		
Perseverance age 6	0.37		
Mean attitudinal composite age 8	0.35		
Perseverance age 8*	0.34		
Individual responsibility age 8	0.32		
Mean attitudinal composite age 10	0.31		
Mean attitudinal composite age 12	0.31		
Curiosity age 12*	0.31		
Perseverance age 10*	0.30		
Perseverance age 5	0.30		
Perseverance age 12	0.29		
Individual responsibility age 10	0.26		
Social skills with adults age 6	0.26		
Social skills with teachers age 10	0.25		
Good/organised	0.25		
Social skills with adults age 8	0.23		
Inquisitiveness age 6	0.23		
Social skills with peers age 6	0.23		
Peer social-emotional age 5	0.23		
Social skills with peers age 10	0.22		
Communication age 5	0.21	Difficult	0.21
Self social-emotional age 5	0.21		
Social skills with peers age 8	0.20		
Individual responsibility age 12	0.20		
Social skills with teachers age 12	0.19		
Curiosity 8	0.18		
Adult social-emotional age 5	0.18		
Inquisitiveness age 5	0.16		
Curiosity age 10	0.15		
Social skills with peers age 12	0.14		
Extrovert	0.14		
Individualistic*	0.13		

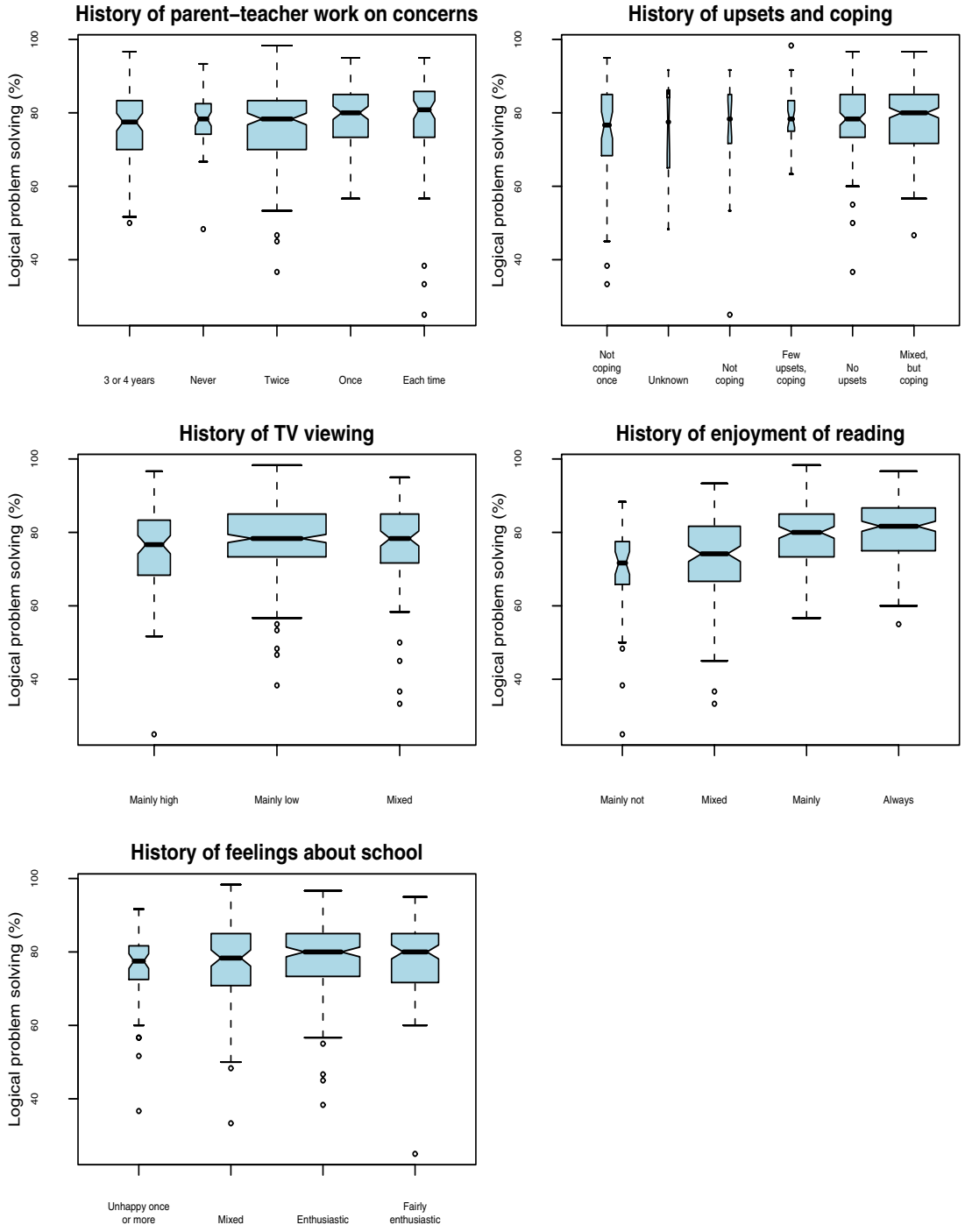
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the logical problem solving score. However, when both family income and maternal qualifications were included in the same model, only the latter was statistically significant. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- History of TV watching ($p = 0.0171$, $R^2 = 2$ percent); no longer significant when maternal qualifications was added to the model
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 13$ percent)

History of enjoyment of reading was still significant in the larger model (Table 54). The boxplots in Figure 10 show the differences for all the history variables.

Figure 10 **Logical problem solving scores for history groupings of five variables**



The explanatory variables accounted for 23 percent of the variability in logical problem solving scores. The statistically significant explanatory variables are given in Table 54.

Table 54 **Model for logical problem solving score**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Perseverance 8	0.08	0.02	0.0013
Perseverance 10	0.06	0.03	0.0195
Curiosity 12	0.09	0.02	0.0002
Individualistic	0.12	0.05	0.0150
History variables			
History of enjoyment of reading			< 0.0001
Mainly yes or qualified yes	-0.02	0.10	0.8325
Mixed responses	-0.49	0.11	< 0.0001
Two or more no	-0.67	0.18	0.0002

When maternal qualifications and family income were added to the model, only maternal qualifications added significantly to the model (p = 0.0002), and neither the perseverance 10 nor individualistic scores remained statistically significant. The model accounted for 26 percent of the variability in logical problem solving.

Mean attitudinal composite score

There were weak to moderate correlations between the mean attitudinal composite score at 14 and 31 of the explanatory variables. These variables are listed in Table 55.

Table 55 **Variables correlated with mean attitudinal composite scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Perseverance age 12*	0.56		
Mean attitudinal composite age 12	0.55		
Individual responsibility age 12	0.48		
Individual responsibility age 10	0.45		
Mean attitudinal composite age 10*	0.44		
Mean attitudinal composite age 8	0.42		
Perseverance age 10	0.42		
Individual responsibility age 8	0.42		
Good/organised*	0.42		
Social skills with teachers age 12	0.42	Difficult	0.41
Perseverance age 8	0.40		
Perseverance age 6	0.39		
Social skills with peers age 12	0.37		
Communication age 6	0.36		
Curiosity age 12	0.35		
Social skills with teachers age 10	0.34		
Social skills with peers age 8	0.33		
Social skills with adults age 6	0.33		
Social skills with adults age 8	0.32		
Social skills with peers age 10	0.32		
Social skills with peers age 6	0.31		
Peer social-emotional age 5	0.30		
Perseverance age 5	0.21		
Communication age 5	0.21		
Extrovert	0.19		
Adult social-emotional age 5	0.19		
Self social-emotional age 5	0.17		
Inquisitiveness age 5	0.15		
Curiosity age 10	0.13		
Curiosity age 8	0.13		

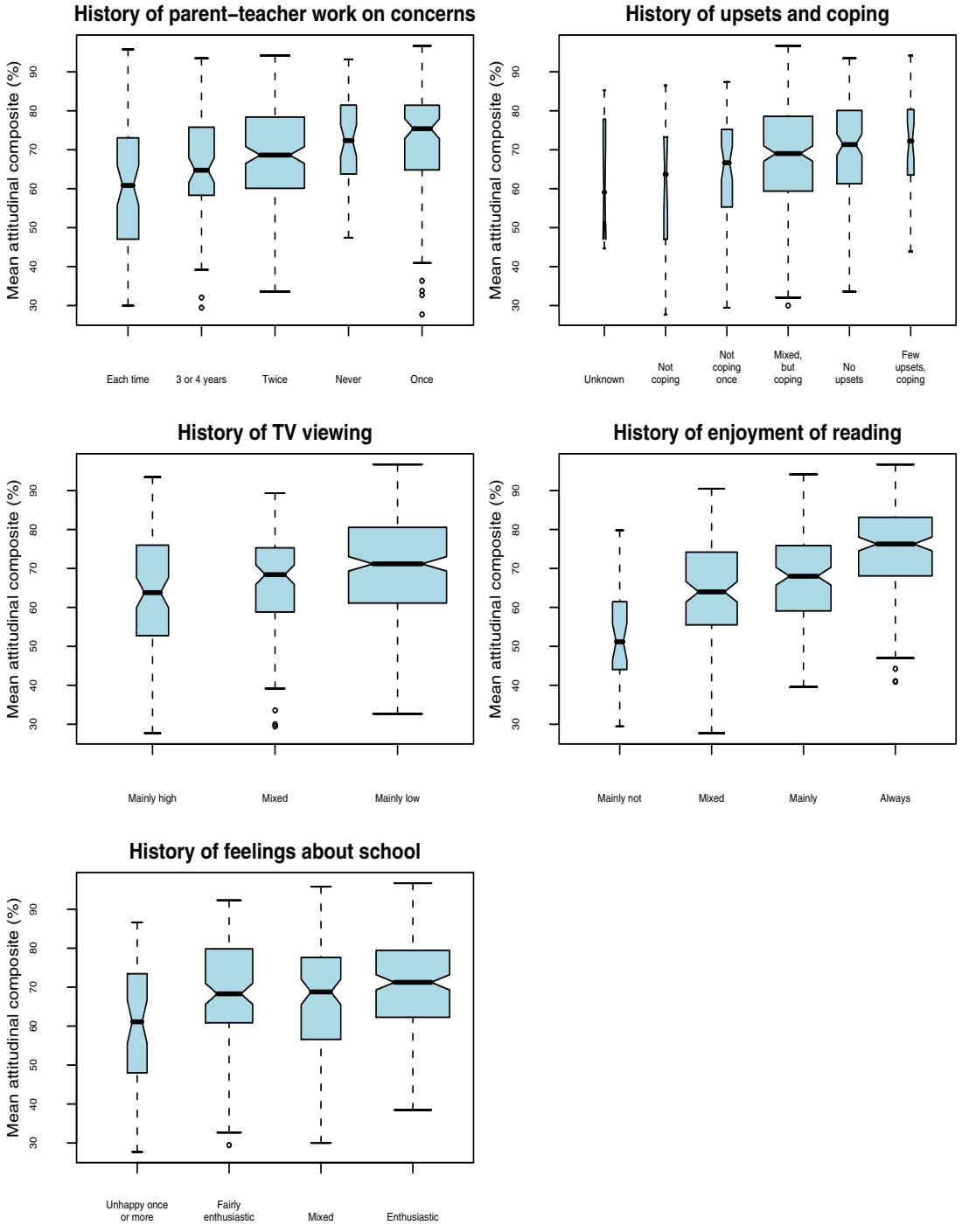
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the mean attitudinal competency score, although the models fitted with family income at age 14 accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- History of parents and teachers working together on concerns ($p < 0.0001$, $R^2 = 6$ percent)
- History of upsets and coping with them ($p = 0.0120$, $R^2 = 2$ percent)
- History of TV watching ($p = 0.0003$, $R^2 = 3$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 19$ percent)
- History of feelings about school ($p = 0.0003$, $R^2 = 3$ percent)

History of enjoyment of reading was still significant in the larger model (Table 56). The boxplots in Figure 11 show the differences for all the history variables.

Figure 11 **Mean attitudinal competency scores for five history variables**



Forty-one percent of the variability in the mean attitudinal competency score was explained by perseverance scores at 12, the mean attitudinal composite competency score at 10, the good/organised score, and history of enjoyment of reading.

The model is shown in Table 56.

Table 56 **Model for mean attitudinal competency scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Perseverance 12	0.23	0.03	< 0.0001
Mean attitudinal composite 10	0.16	0.04	0.0002
Good/organised	0.09	0.04	0.0086
History variable			
History of enjoyment of reading			< 0.0001
Mainly yes/qualified yes	-0.51	0.12	< 0.0001
Mixed responses	-0.62	0.13	< 0.0001
Two or more no	-1.02	0.22	< 0.0001

When maternal qualifications and family income scores were added to the model above, maternal qualifications contributed significantly to the model ($p = 0.0016$), the model accounted for 43 percent of the variability in mean attitudinal composite score.

Engagement in learning

Absorbed in learning

There were weak correlations between the absorbed in learning score at 14 and 14 of the explanatory variables. These variables are listed in Table 57.

Table 57 **Variables correlated with absorbed in learning scores**

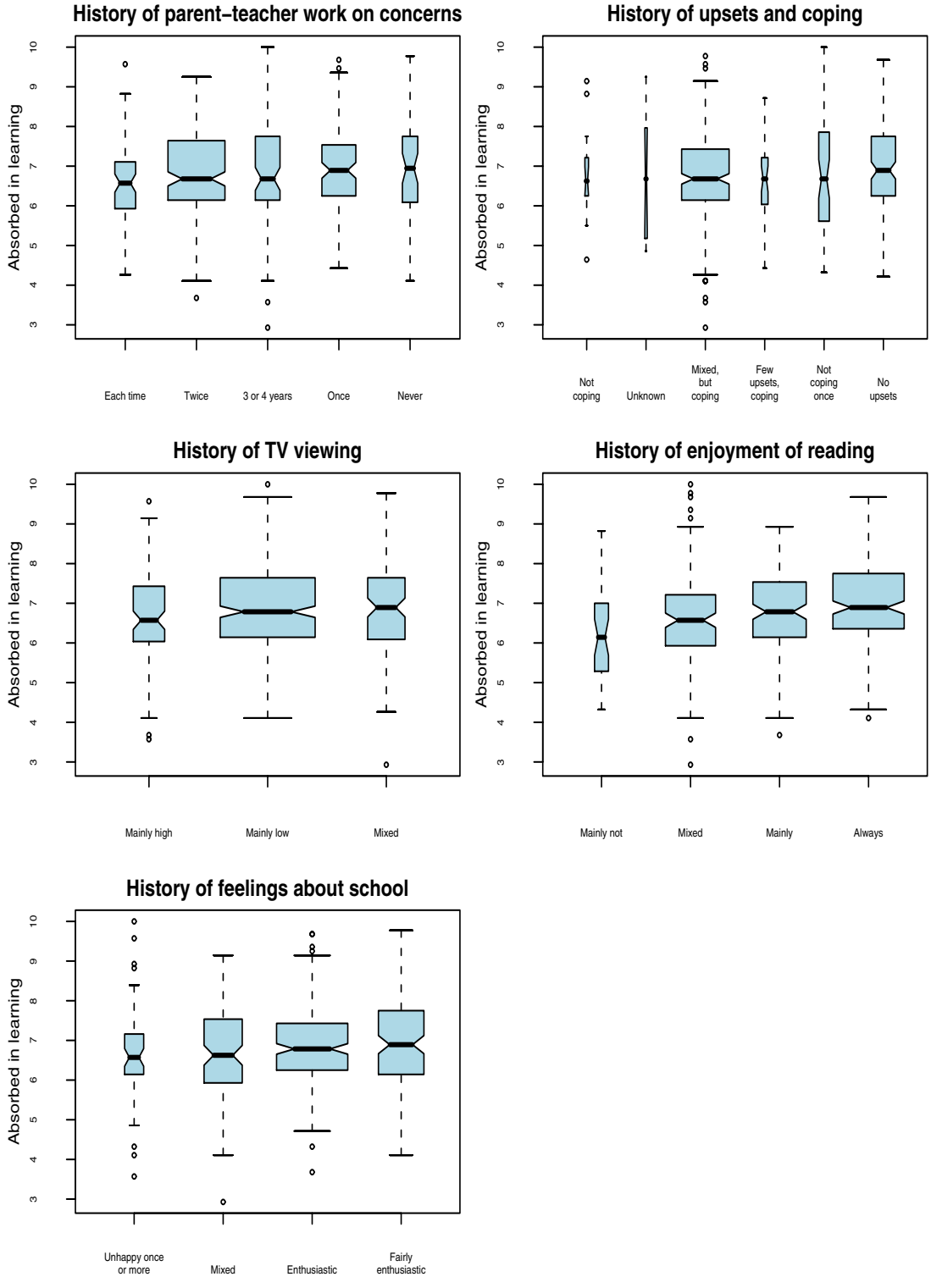
Explanatory variables	Positive correlations
Social skills with adults age 6	0.20
Perseverance age 12	0.19
Mean attitudinal composite age 12	0.18
Good/organised*	0.17
Communication age 6	0.16
Inquisitiveness age 5	0.16
Individual responsibility age 12	0.15
Perseverance age 6	0.15
Social skills with peers age 6	0.15
Curiosity age 12	0.14
Individual responsibility age 10	0.13
Social skills with teachers age 12	0.13
Perseverance age 8	0.13
Social skills with adults age 8	0.13

* Variable included in model below

Family income at 14, but neither family income at 5 nor maternal qualifications, accounted for a significant amount of the variation in the absorbed in learning score. One-way ANOVA models were fitted for each of the history variables in turn. The only one that was statistically significant was history of enjoyment of reading (p = 0.0006, R^2 = 3 percent), which was still significant after family income at 14 was added to the model.

The difference was still significant in the larger model. The boxplots in Figure 12 show the differences for all the history variables.

Figure 12 **Absorbed in learning scores for five history variables**



Four percent of the variability in the absorbed in learning score was explained by the good/organised score, and history of enjoyment of reading.

The model is shown in Table 58.

Table 58 **Model for absorbed in learning scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Good/organised	0.09	0.03	0.0060
History variable			
History of enjoyment of reading			0.0150
Mainly yes/qualified yes	-0.20	0.13	0.1132
Mixed responses	-0.31	0.13	0.0201
Two or more no	-0.60	0.21	0.0048

When maternal qualifications and family income scores were added to the model above, family income at age 14 contributed significantly to the model (p = 0.0165), the model accounted for six percent of the variability in absorbed in learning score.

Confident at school

There were weak correlations between the confident at school score at 14 and 19 of the explanatory variables. These variables are listed in Table 59.

Table 59 **Variables correlated with confident at school scores**

Explanatory variables	Positive correlations
Communication age 6	0.28
Perseverance age 12*	0.26
Mean attitudinal composite age 12	0.25
Mean attitudinal composite age 8	0.22
Perseverance age 6	0.22
Social skills with peers age 6	0.22
Perseverance age 8	0.21
Curiosity age 12	0.21
Mean attitudinal composite age 10	0.21
Good/organised	0.20
Perseverance age 10	0.20
Social skills with adults age 6	0.20
Individual responsibility age 12	0.19
Individual responsibility age 8	0.19
Individual responsibility age 10	0.17
Social skills with teachers age 12	0.16
Social skills with peers age 12	0.16
Social skills with peers age 10	0.15
Social skills with teachers age 10	0.15

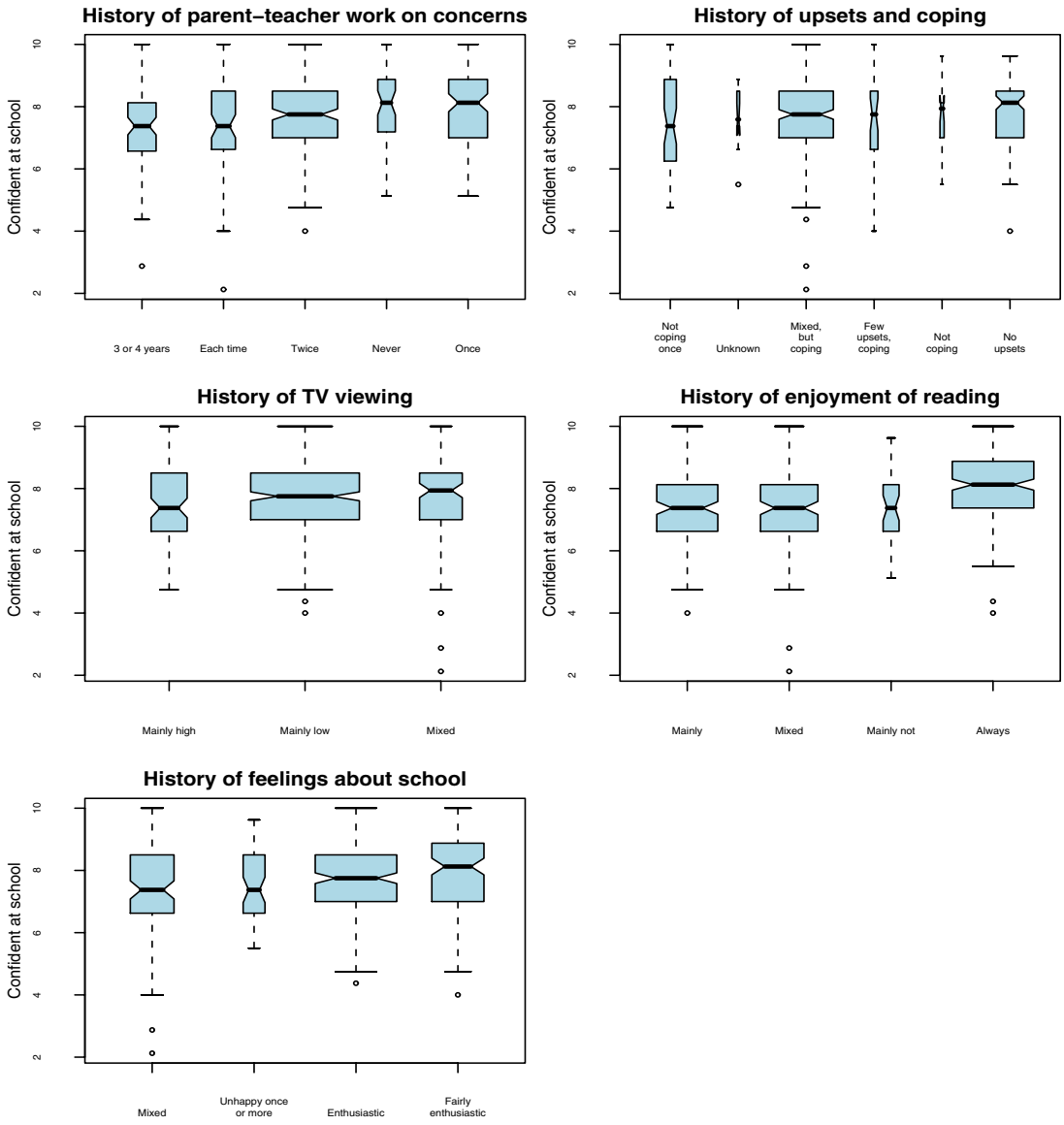
* Variable included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the confident at school score, although the models fitted with family income at age 14 accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- History of parents and teachers working together on concerns ($p = 0.0025$, $R^2 = 3$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 6$ percent)
- History of feelings about school ($p = 0.0071$, $R^2 = 2$ percent)

History of enjoyment of reading was still significant in the larger model (Table 60). The boxplots in Figure 13 show the differences for all the history variables.

Figure 13 **Confident at school scores for five history variables**



Ten percent of the variability in the confident at school score was explained by the perseverance 12 score, and history of enjoyment of reading.

The model is shown in Table 60.

Table 60 **Model for confident at school scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Perseverance 12	0.13	0.03	< 0.0001
History variable			
History of enjoyment of reading			< 0.0001
Mainly yes/qualified yes	-0.52	0.13	< 0.0001
Mixed responses	-0.54	0.14	< 0.0001
Two or more no	-0.30	0.23	0.1880

When maternal qualifications and family income scores were added to the model above, neither contributed significantly to the model.

Disengaged in learning score

There were weak correlations between the disengaged in learning score and 24 of the explanatory variables. As a high disengagement score indicates that the student is *not* engaged, the majority of the correlations are negative. The variables with some correlation with the disengaged in learning score are listed in Table 61.

Table 61 **Variables correlated with disengaged in learning scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
		Mean attitudinal composite age 12	0.28
		Perseverance age 12	0.27
		Individual responsibility age 10*	0.27
		Individual responsibility age 12*	0.27
		Good/organised*	0.26
		Mean attitudinal composite age 10	0.25
		Social skills with teachers age 12	0.24
		Social skills with peers age 6	0.23
		Individual responsibility age 8	0.22
		Social skills with teachers age 10	0.22
		Perseverance age 10	0.21
		Perseverance age 8	0.21
		Social skills with adults age 6	0.21
		Communication age 6	0.21
		Perseverance age 6	0.21
Difficult	0.20	Mean attitudinal composite age 8	0.20
		Social skills with peers age 12	0.20
		Social skills with peers age 8	0.18
		Social skills with adults age 8	0.17
		Social skills with peers age 10	0.17
		Peer social emotional age 5	0.17
		Curiosity age 12	0.16
		Perseverance age 5	0.14

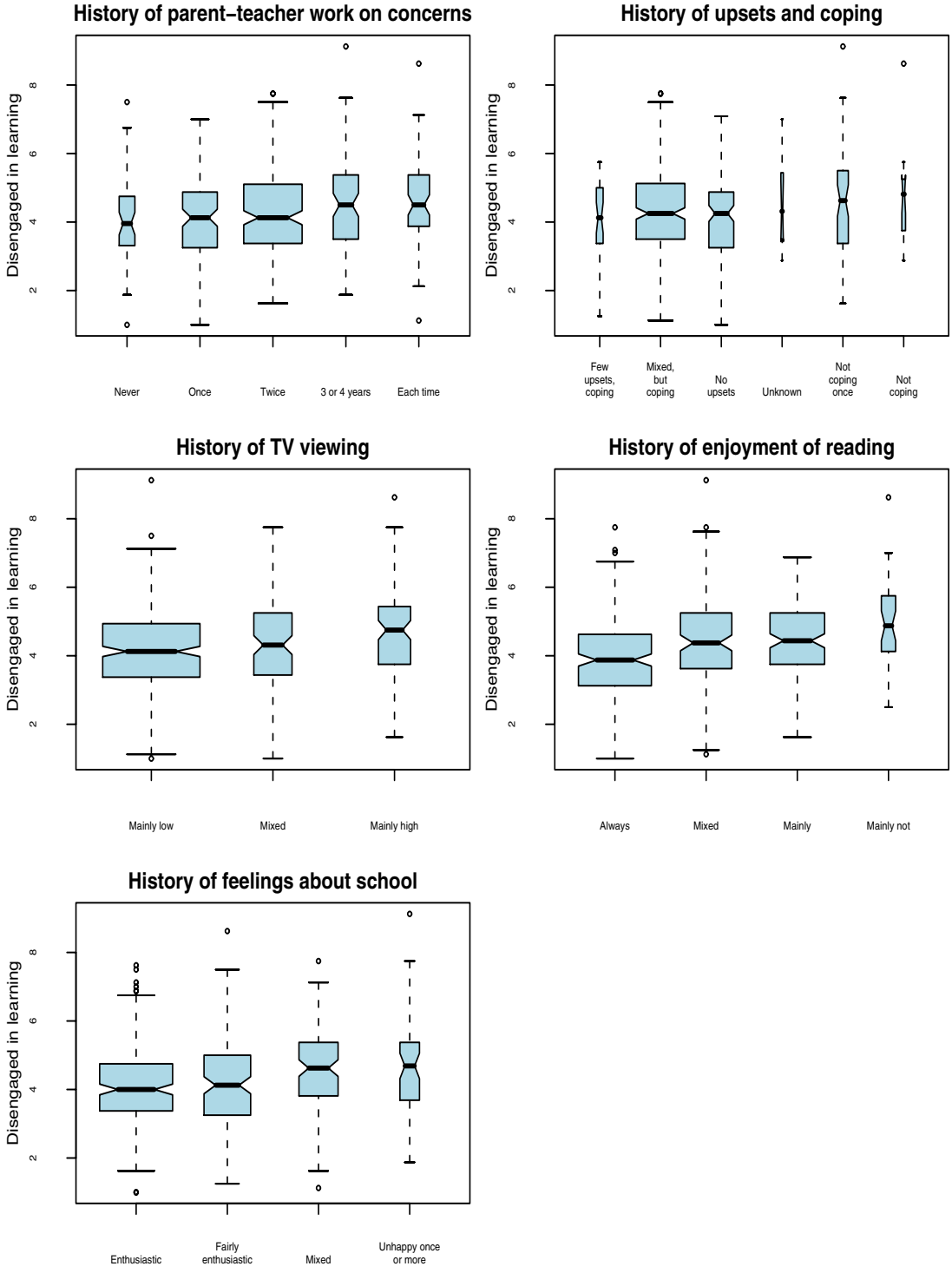
* Variables included in model below

Family income at 14 and maternal qualifications accounted for a significant amount of the variation in the disengaged in learning score. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- History of parents and teachers working together on concerns ($p = 0.0091$, $R^2 = 2$ percent)
- History of TV watching ($p = 0.0059$, $R^2 = 2$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 6$ percent)
- History of feelings about school ($p = 0.0036$, $R^2 = 2$ percent)

History of enjoyment of reading was still significant in the larger model (Table 62). The boxplots in Figure 14 show the differences for all the history variables

Figure 14 **Disengaged in learning scores for five history variables**



Twelve percent of the variability in the disengaged in learning score was explained by individual responsibility scores at 10 and 12, the good/organised score, and history of enjoyment of reading.

The model is shown in Table 62.

Table 62 **Model for disengaged in learning scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Individual responsibility 10	-0.08	0.03	0.0236
Individual responsibility 12	-0.07	0.04	0.0374
Good/organised	-0.08	0.04	0.0379
History variable			
History of enjoyment of reading			0.0083
Mainly yes/qualified yes	0.41	0.13	0.0027
Mixed responses	0.29	0.14	0.0417
Two or more no	0.56	0.23	0.0153

When maternal qualifications and family income scores were added to the model above, neither contributed significantly to the model.

Engaged in school score

There were weak correlations between the engaged in school score and 23 of the explanatory variables. These variables are listed in Table 63.

Table 63 **Variables correlated with engaged in school scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Perseverance age 12	0.30		
Mean attitudinal composite age 12	0.29		
Good/organised*	0.29		
Individual responsibility age 12	0.24		
Communication age 6	0.24		
Curiosity age 12*	0.22		
Mean attitudinal composite age 8	0.22		
Social skills with peers age 12	0.22		
Perseverance age 8	0.22		
Individual responsibility age 8	0.21	Difficult	0.21
Individual responsibility age 10	0.21		
Social skills with adults age 6	0.21		
Social skills with teachers age 12	0.20		
Perseverance age 6	0.20		
Mean attitudinal composite age 10	0.19		
Social skills with peers age 6	0.19		
Social skills with peers age 8	0.18		
Perseverance age 10	0.18		
Social skills with adults age 8	0.16		
Social skills with peers age 10	0.16		
Social skills with teachers age 10	0.14		
Introvert*	0.12		

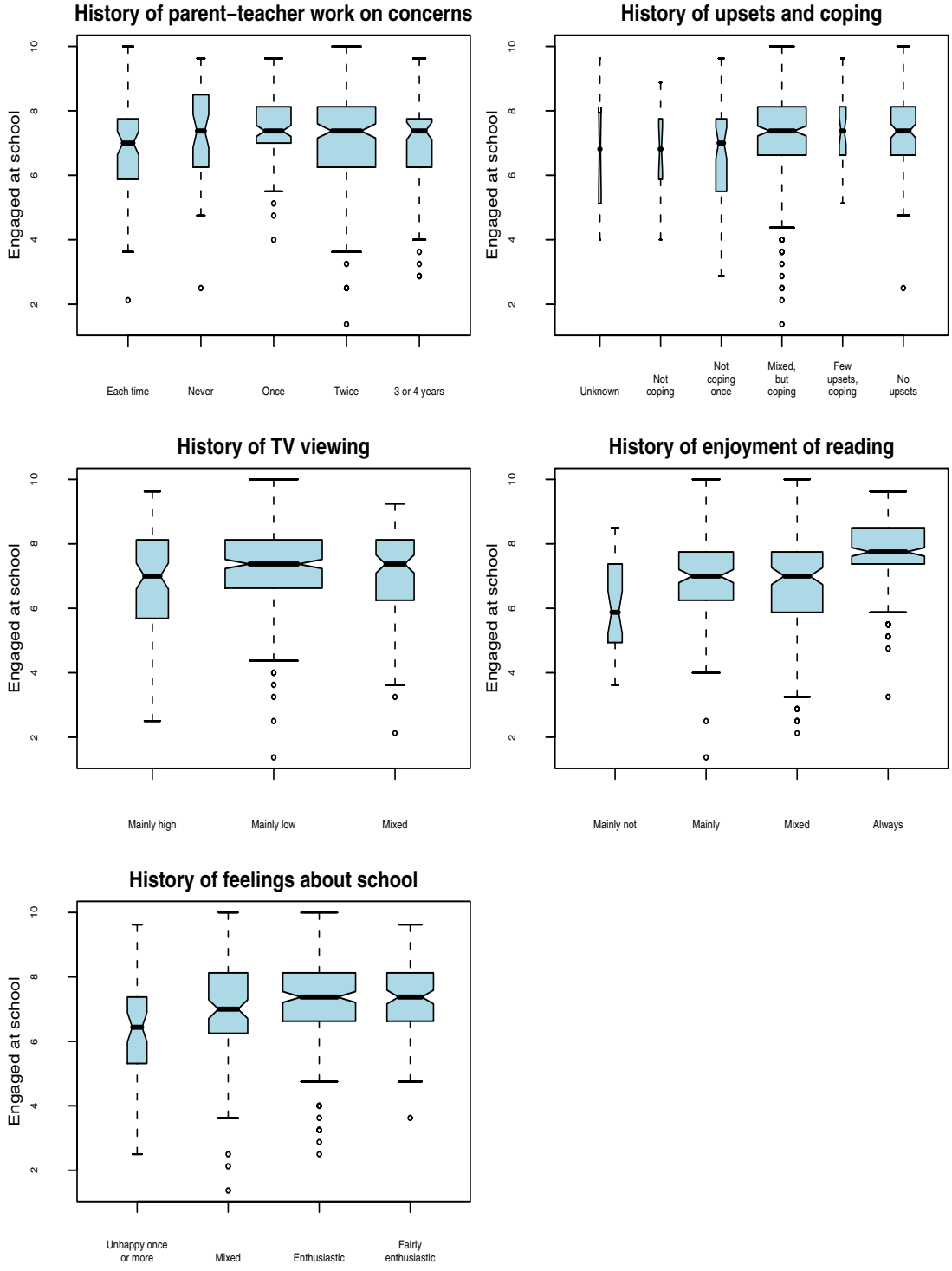
* Variables included in model below

Family income at 14 and maternal qualifications accounted for a significant amount of the variation in the engaged in school score. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- History of parents and teachers working together on concerns ($p = 0.0034$, $R^2 = 2$ percent)
- History of upsets and coping with them ($p = 0.0173$, $R^2 = 2$ percent)
- History of TV watching ($p = 0.0021$, $R^2 = 2$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 14$ percent)
- History of feelings about school ($p < 0.0001$, $R^2 = 5$ percent)

History of enjoyment of reading and feelings about school were still significant in the larger model (Table 64). The boxplots in Figure 15 show the differences for all the history variables.

Figure 15 **Engaged in school scores for five history variables**



Twenty-two percent of the variability in the engaged in school score was explained by curiosity score at 12, the good/organised score, the introvert score, history of feelings about school, and history of enjoyment of reading. The model is shown in Table 64.

Table 64 **Model for engaged in school scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Curiosity 12	0.09	0.03	0.0042
Good/organised	0.11	0.04	0.0046
Introvert	0.16	0.05	0.0040
History variables			
History of enjoyment of reading			< 0.0001
Mainly yes/qualified yes	-0.81	0.15	< 0.0001
Mixed responses	-0.82	0.15	< 0.0001
Two or more no	-1.21	0.25	< 0.0001
History of feelings about school			0.0014
Fairly enthusiastic	0.08	0.15	0.6017
Mixed	-0.22	0.16	0.1644
Unhappy at least once	-0.71	0.20	0.0006

When maternal qualifications and family income scores were added to the model above, family income at age 14 contributed significantly to the model (p = 0.0073), which then accounted for 24 percent of the variability in engagement at school score.

External markers of achievement

There were weak correlations between the external markers of achievement score and 17 of the explanatory variables. The negative correlation with the introvert score means that the more introvert students tended to have lower scores on external markers of achievement, and the less introvert students tended to have higher scores. These variables are listed in Table 65.

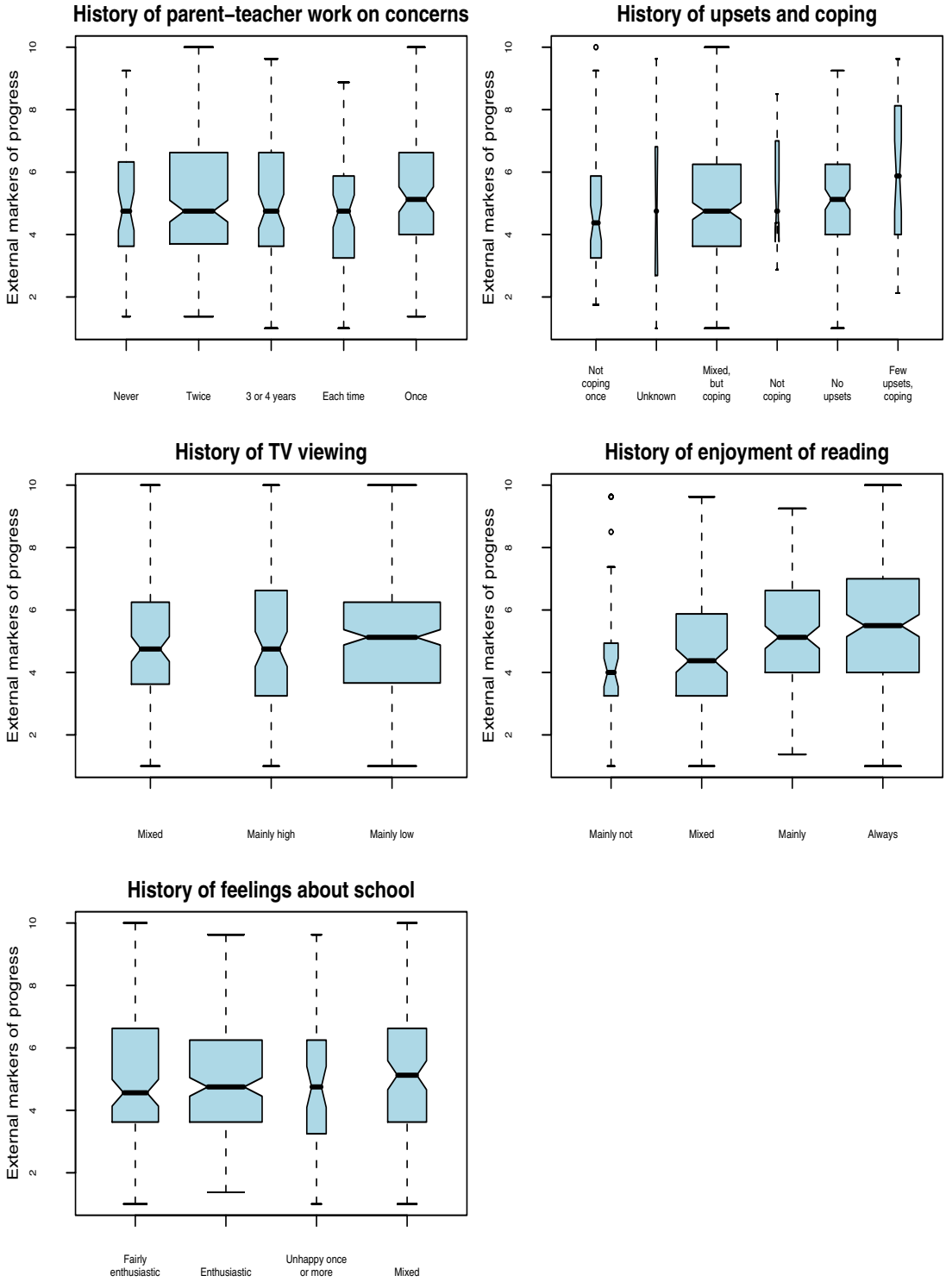
Table 65 **Variables correlated with external markers of achievement scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Curiosity age 12*	0.20		
Perseverance age 6	0.19		
Communication age 6	0.19		
Perseverance age 10*	0.18		
Perseverance age 12	0.17		
Mean attitudinal composite age 10	0.17		
Peer and attitudinal-emotional age 5	0.16		
Perseverance age 8	0.15	Introvert*	0.15
Inquisitiveness age 5	0.15		
Mean attitudinal composite age 12	0.14		
Perseverance age 5	0.14		
Mean attitudinal composite age 8	0.13		
Individual responsibility age 8	0.13		
Individual responsibility age 10	0.13		
Curiosity age 10	0.13		
Communication age 5	0.13		

* Variables included in model below

Maternal qualifications accounted for a significant amount of the variation in the external markers of achievement score. One-way ANOVA models were fitted for each of the history variables in turn, and the only one that was statistically significant was history of enjoyment of reading ($p < 0.0001$, $R^2 = 5$ percent), which was still significant after maternal qualifications was included in the model, and in the larger model (Table 66). The boxplots in Figure 16 show the differences for all the history variables.

Figure 16 **External markers of achievement scores for five history variables**



Nine percent of the variability in the external markers of achievement score was explained by curiosity score at 12, perseverance score at 10, the introvert score, and history of enjoyment of reading. The model is shown in Table 66.

Table 66 **Model for external markers of achievement scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Curiosity 12	0.12	0.05	0.0173
Perseverance 10	0.11	0.05	0.0255
Introvert	-0.23	0.08	0.0024
History variables			
History of enjoyment of reading			0.0015
Mainly yes/qualified yes	0.02	0.22	0.9335
Mixed responses	-0.73	0.22	0.0011
Two or more no	-0.75	0.37	0.0404

When maternal qualifications and family income scores were added to the model above, neither contributed significantly to the model.

Internal markers of achievement

There were weak correlations between the internal markers of achievement score and 26 of the explanatory variables. These variables are listed in Table 67.

Table 67 **Variables correlated with internal markers of achievement scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Perseverance age 12	0.29		
Mean attitudinal composite age 12	0.28		
Curiosity age 12*	0.26		
Social skills with peers age 6	0.25		
Communication age 6	0.25		
Social skills with adults age 6	0.24		
Perseverance age 10	0.23		
Mean attitudinal composite age 10	0.23		
Good/organised*	0.23		
Individual responsibility age 12	0.21		
Perseverance age 8	0.20		
Individual responsibility age 10	0.20		
Perseverance age 6	0.20		
Mean attitudinal composite age 8	0.19	Difficult	0.19
Social skills with teachers age 10	0.18		
Inquisitiveness age 5	0.18		
Individual responsibility age 8	0.16		
Curiosity age 10	0.16		
Social skills with teachers age 12	0.16		
Adult social-emotional age 5	0.16		
Peer social-emotional age 5	0.15		
Social skills with peers age 12	0.14		
Social skills with adults age 8	0.13		
Perseverance age 5	0.13		
Inquisitiveness age 6	0.13		

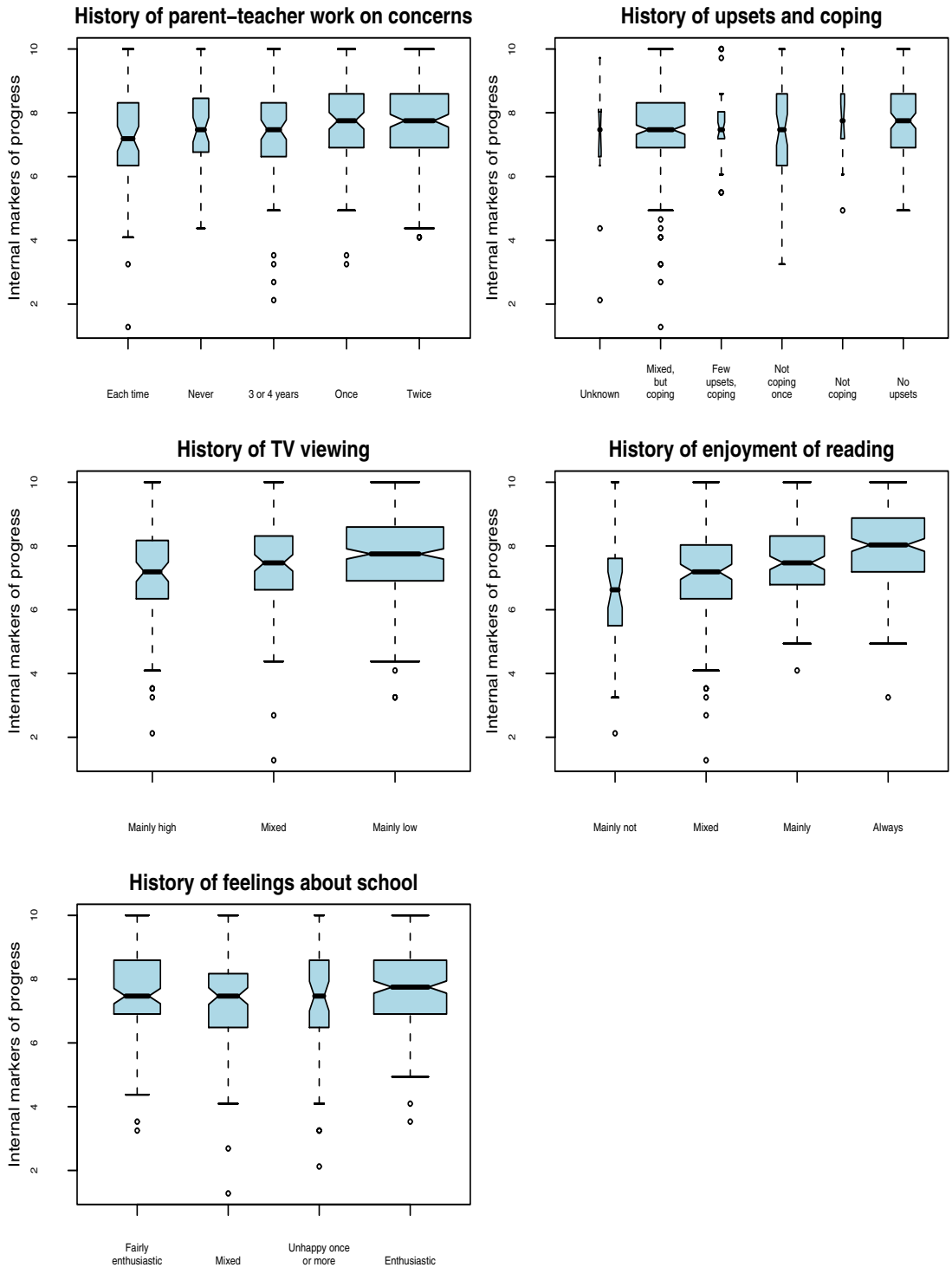
* Variables included in model below

Family income at 14 and maternal qualifications accounted for a significant amount of the variation in the internal markers of achievement score. However, when both were included in the same model, only family income at 14 remained statistically significant. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- History of TV watching ($p = 0.0165$, $R^2 = 1$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 9$ percent)
- History of feelings about school ($p = 0.0319$, $R^2 = 1$ percent)

History of enjoyment of reading was still significant in the larger model (Table 68). The boxplots in Figure 17 show the differences for all the history variables

Figure 17 **Internal markers of achievement scores for five history variables**



Fourteen percent of the variability in the internal markers of achievement score was explained by curiosity score at 12, being good/organised score, and history of enjoyment of reading. The model is shown in Table 68.

Table 68 **Model for internal markers of achievement scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Curiosity 12	0.13	0.03	0.0001
Good/organised	0.11	0.04	0.0057
History variables			
History of enjoyment of reading			< 0.0001
Mainly yes/qualified yes	-0.42	0.15	0.0060
Mixed responses	-0.80	0.16	< 0.0001
Two or more no	-0.87	0.26	0.0006

When maternal qualifications and family income scores were added to the model above, neither contributed significantly to the model.

Disrupted learning environment

There were weak correlations between the disrupted learning environment score and 16 of the explanatory variables. These variables are listed in Table 69.

Table 69 **Variables correlated with disrupted learning environment scores**

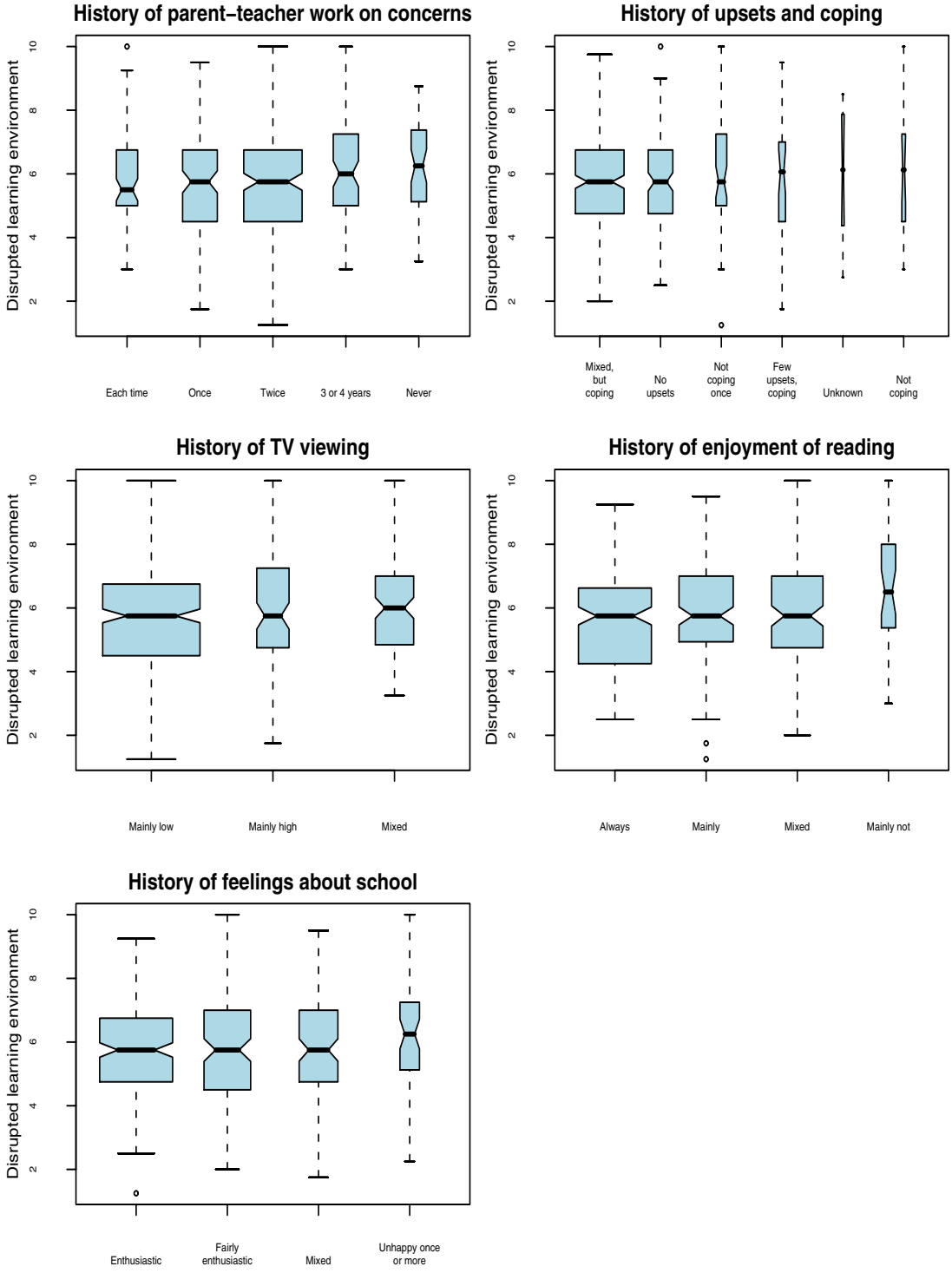
Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
		Perseverance age 5	0.24
		Social skills with peers age 6	0.22
		Peer social-emotional age 5	0.21
		Communication age 5	0.20
		Perseverance age 8	0.19
		Mean attitudinal composite age 8*	0.18
		Social skills with peers age 10*	0.18
		Adult social-emotional age 5	0.18
		Individual responsibility age 8	0.17
		Social skills with adults age 8	0.17
		Mean attitudinal composite age 10	0.16
		Perseverance age 6	0.15
		Extrovert	0.14
		skills with peers age 8	0.14
Introvert	0.12	Perseverance age 12	0.13

* Variables included in model below

Family income at 14, and to a much lesser extent family income at age 5, accounted for a significant amount of the variation in the disrupted learning environment score. One-way ANOVA models were fitted for each of the history variables in turn, and the only history of enjoyment of reading was statistically significant (p = 0.0160, R^2 = 2 percent). It was no longer significant when family income at 14 was added to the model, nor did it add significantly to the larger model including more explanatory variables.

The history variables are shown in the boxplots in Figure 18.

Figure 18 **Disrupted learning environment scores for five history variables**



Five percent of the variability in the disrupted learning environment score was explained by the mean attitudinal composite score at age 8, social skills with peers score at 10, and introvert score. The model is shown in Table 70.

Table 70 **Model for disrupted learning environment scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Mean attitudinal composite 8	-0.13	0.06	0.0217
Social skills with peers 10	-0.18	0.07	0.0068
Introvert	0.15	0.06	0.0183

When maternal qualifications and family income scores were added to the model above, family income at age 5 contributed significantly to the model ($p = 0.0032$), and the mean attitudinal composite at age 8 became indicative ($p = 0.0624$). The model accounted for eight percent of the variability in disrupted learning environment score.

Negative about English

There were weak correlations between the negative about English score and 22 of the explanatory variables. These variables are listed in Table 71.

Table 71 **Variables correlated with negative about English scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
		Mean attitudinal composite age 12	0.26
		Perseverance age 12	0.25
		Social skills with teachers age 12	0.23
		Social skills with peers age 6	0.22
		Peer social-emotional age 5	0.21
		Individual responsibility age 12	0.20
Difficult	0.19	Curiosity age 12	0.19
		Adult social-emotional age 5	0.19
		Social skills with adults age 6	0.19
		Social skills with adults age 8	0.18
		Mean attitudinal composite age 8	0.18
		Social skills with peers age 12	0.17
		Communication age 6	0.17
		Perseverance age 8	0.16
		Social skills with peers age 8	0.15
		Social skills with teachers age 10	0.15
		Good/organised	0.15
		Mean attitudinal composite age 10	0.14
		Social skills with peers age 10	0.13
		Individual responsibility age 8	0.13
		Perseverance age 6	0.13

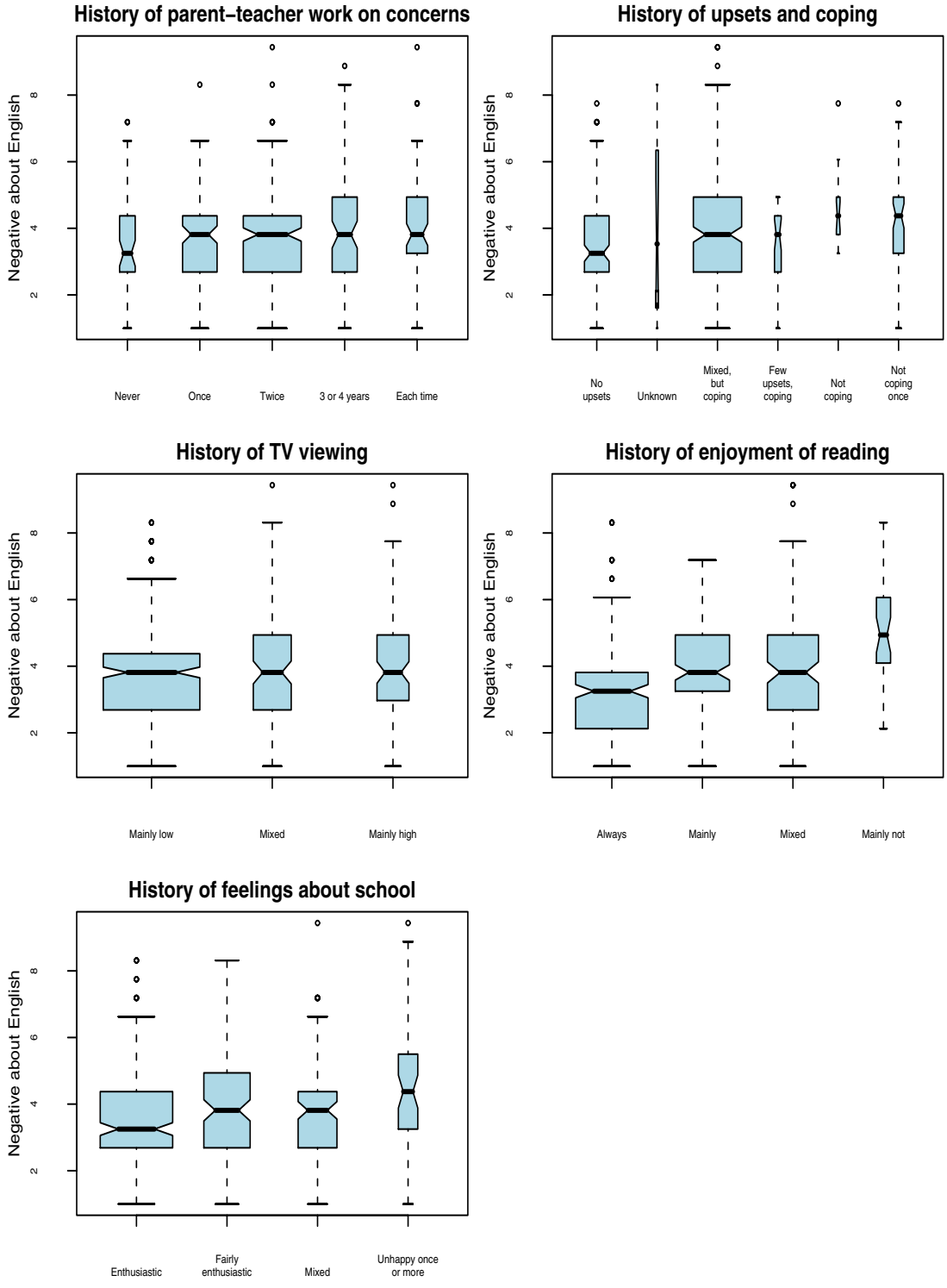
* Variables included in model below

Family income at 14 and maternal qualifications accounted for a significant amount of the variation in the negative about English score. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- History of upsets and coping with them ($p = 0.0499$, $R^2 = 1$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 10$ percent)
- History of feelings about school ($p = 0.0288$, $R^2 = 1$ percent)

History of enjoyment of reading was still significant in the larger model (Table 72). The boxplots in Figure 19 show the differences for all the history variables

Figure 19 **Negative about English scores for five history variables**



Twelve percent of the variability in the negative about English score was explained by the social skills with teachers score at 12, and history of enjoyment of reading. The model is shown in Table 72.

Table 72 **Model for negative about English scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variable			
Social skills with teachers 12	-0.13	0.04	0.0066
History variable			
History of enjoyment of reading			< 0.0001
Mainly yes/qualified yes	0.59	0.17	0.0005
Mixed responses	0.70	0.17	< 0.0001
Two or more no	1.58	0.28	< 0.0001

When maternal qualifications and family income scores were added to the model above, neither contributed statistically significantly to the model.

Negative about mathematics

There were weak correlations between the negative about mathematics score and 12 of the explanatory variables. These variables are listed in Table 73.

Table 73 **Variables correlated with negative about mathematics scores**

Explanatory variables	Negative correlations
Perseverance age 12*	0.22
Curiosity age 12*	0.20
Mean attitudinal composite age 12	0.20
Perseverance age 8	0.18
Good/organised	0.18
Perseverance age 6	0.17
Communication age 6	0.17
Perseverance age 10	0.15
Mean attitudinal composite age 8	0.14
Social skills with teachers age 12	0.14
Perseverance age 5	0.14
Individual responsibility age 12	0.12

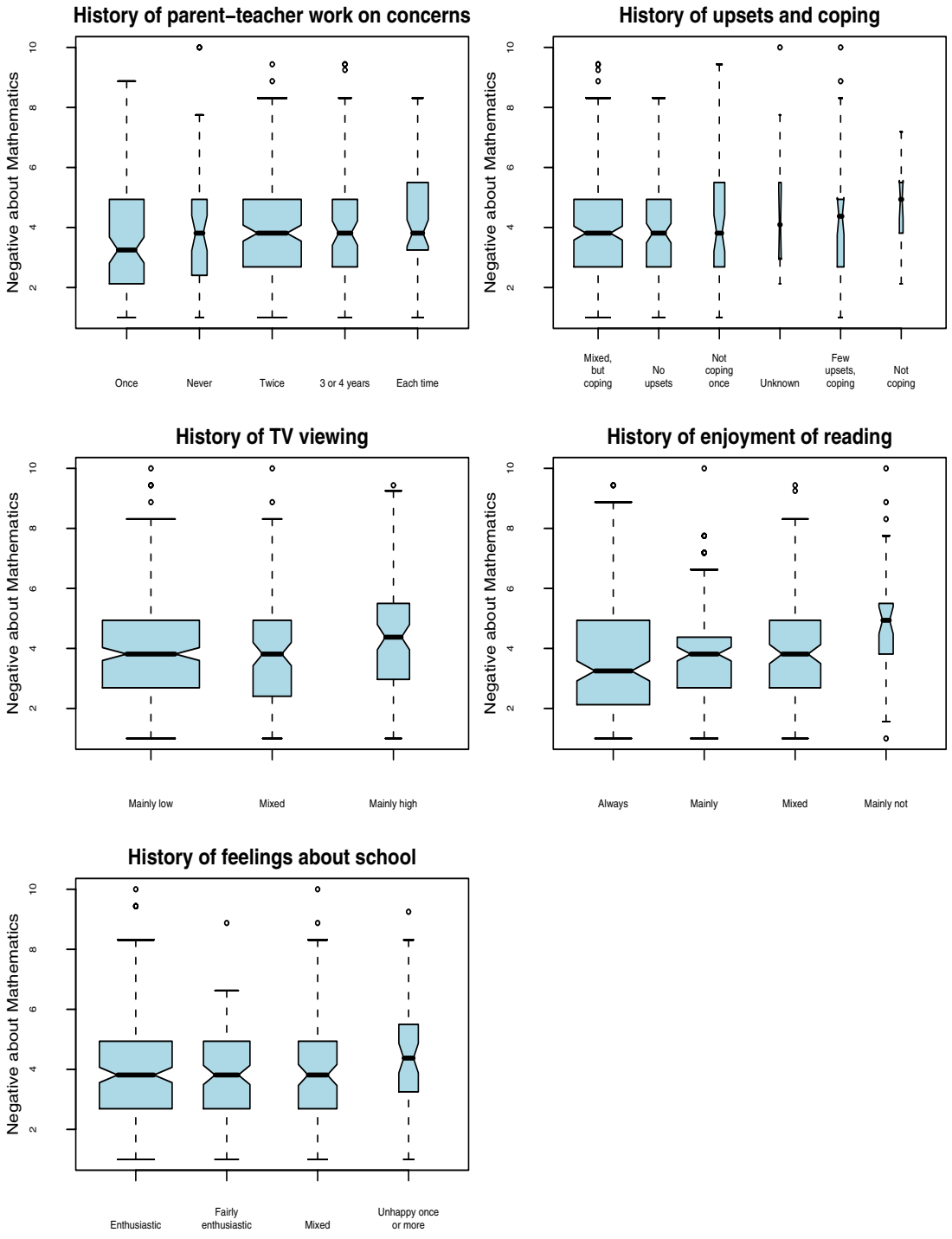
* Variables included in model below

Family income at 14 and maternal qualifications accounted for a significant amount of the variation in the negative about mathematics score (maternal qualifications was the more important of the two in this case). One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- History of TV watching ($p = 0.0324$, $R^2 = 1$ percent); no longer significant when maternal qualifications and family income at 14 were added to the model.
- History of enjoyment of reading ($p = 0.0015$, $R^2 = 3$ percent)

Neither of the history variables was still significant in the larger model (Table 74). The boxplots in Figure 20 show the differences for all the history variables

Figure 20 **Negative about mathematics scores for five history variables**



Six percent of the variability in the negative about mathematics score was explained by the perseverance and curiosity scores at 12, and being good/organised score. The model is shown in Table 74.

Table 74 **Model for negative about mathematics scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Perseverance 12	-0.14	0.04	0.0018
Curiosity 12	-0.11	0.05	0.0260

When maternal qualifications and family income scores were added to the model above, maternal qualifications contributed statistically significantly to the model ($p = 0.0256$). The model accounted for seven percent of the variability in the negative about mathematics score.

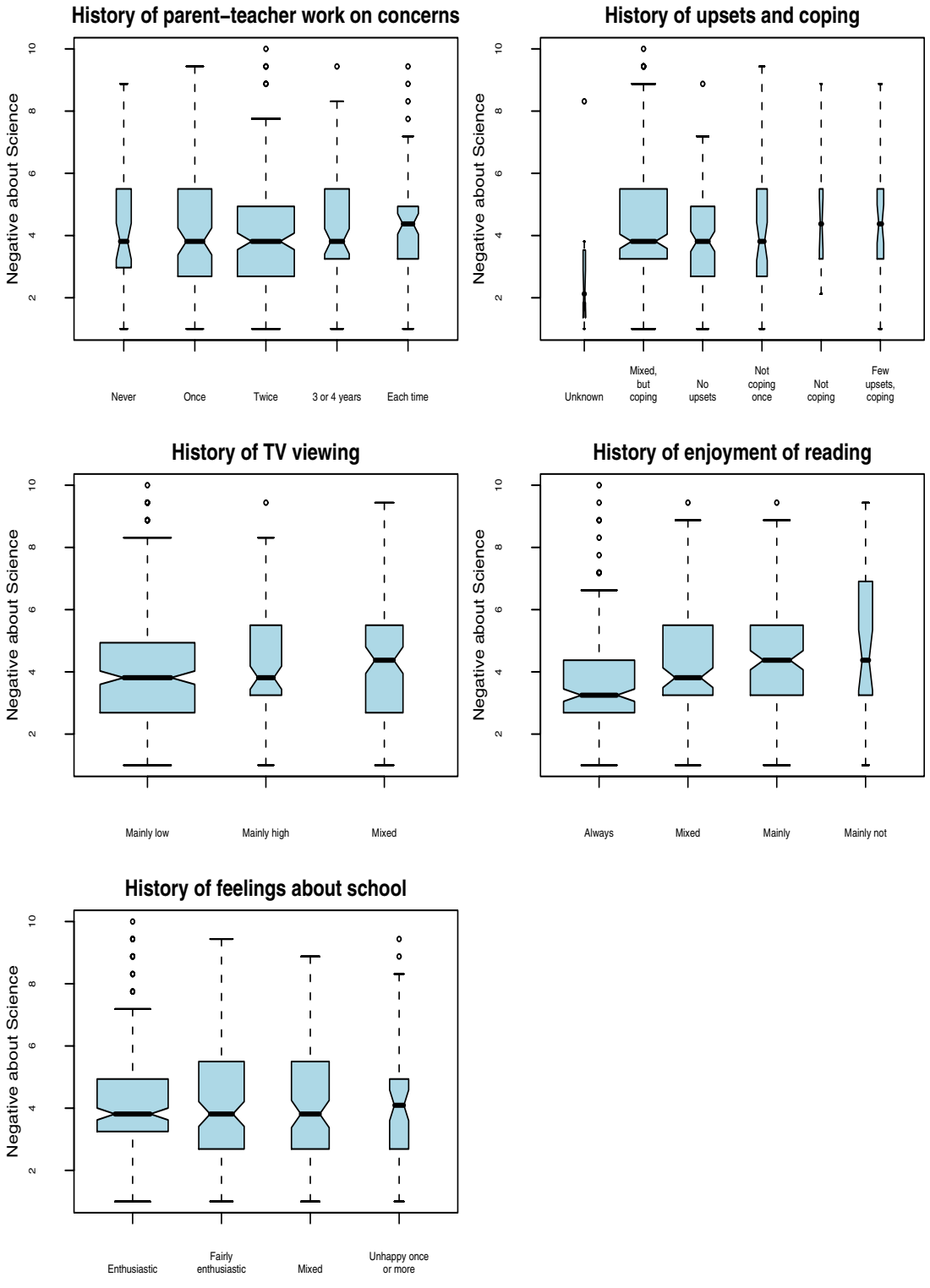
Negative about science

There was a weak correlation between the negative about science score and curiosity at age 12 (r = -0.15).

The only history factor to be statistically significant in one-way ANOVAs for the history factors was history of enjoyment of reading (p = 0.0003, R^2 = 3 percent), which was still significant after the addition of maternal qualifications to the model (family income was not significant), and in the larger model (Table 75).

Boxplots for all the history factors are shown in Figure 21.

Figure 21 **Negative about science scores for five history variables**



Four percent of the variability in the negative about science score was explained by the curiosity scores at 12, and history of enjoyment of reading. The model is shown in Table 75.

Table 75 **Model for negative about science scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Curiosity 12	-0.10	0.04	0.0246
History variable			
History of enjoyment of reading			0.0044
Mainly yes/qualified yes	0.46	0.21	0.0272
Mixed responses	0.50	0.21	0.0181
Two or more no	1.10	0.34	0.0015

When maternal qualifications and family income scores were added to the model above, maternal qualifications contributed statistically significantly to the model (p = 0.0233), and the curiosity at age 12 score was no longer significant. The model accounted for six percent of the variability in the negative about science score.

Positive attitude to English teacher

There were weak correlations between the positive attitude to English teacher score and eight of the explanatory variables. These variables are listed in Table 76.

Table 76 **Variables correlated with positive attitude to English teacher scores**

Explanatory variables	Positive correlations
Social skills with adults age 6	0.19
Communication age 6	0.16
Social skills with peers age 6	0.16
Perseverance age 12	0.15
Mean attitudinal composite age 12	0.15
Individual responsibility age 12	0.15
Curiosity age 12*	0.14
Good/organised*	0.13

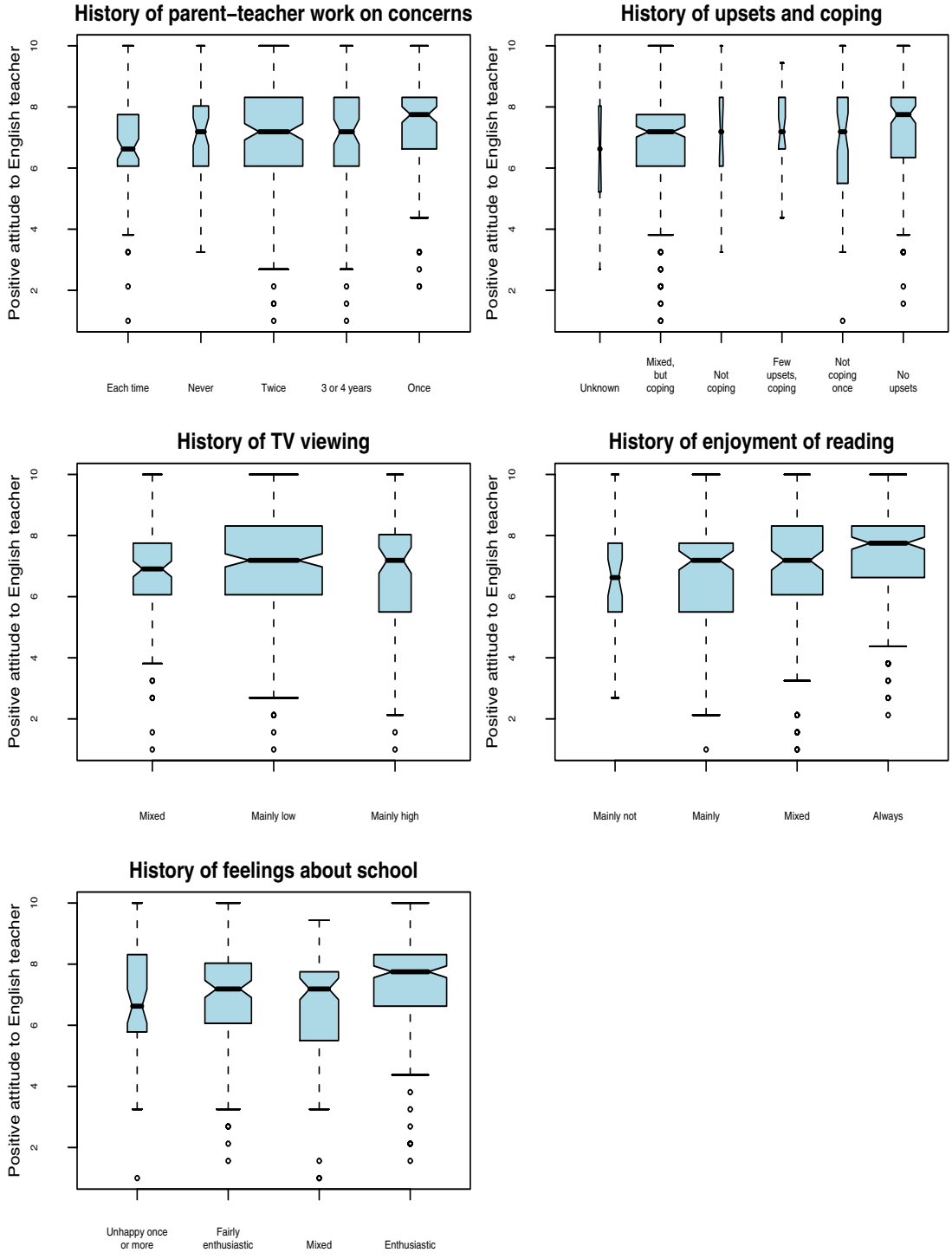
* Variables included in model below

Family income at 14 accounted for a significant amount of the variation in the positive attitude to the English teacher score. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 was added to the model.

- History of enjoyment of reading ($p = 0.0322$, $R^2 = 1$ percent)
- History of feelings about school ($p = 0.0065$, $R^2 = 2$ percent)

Neither was still significant in the larger model (Table 77). The boxplots in Figure 22 show the differences for all the history variables.

Figure 22 **Positive attitude to English teacher scores for five history variables**



Two percent of the variability in the positive attitude to English teacher score was explained by the curiosity scores at 12, and being good/organised score. The model is shown in Table 77.

Table 77 **Model for positive attitude to English teacher scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Curiosity 12	0.10	0.04	0.0193
Good/organised	0.10	0.05	0.0350

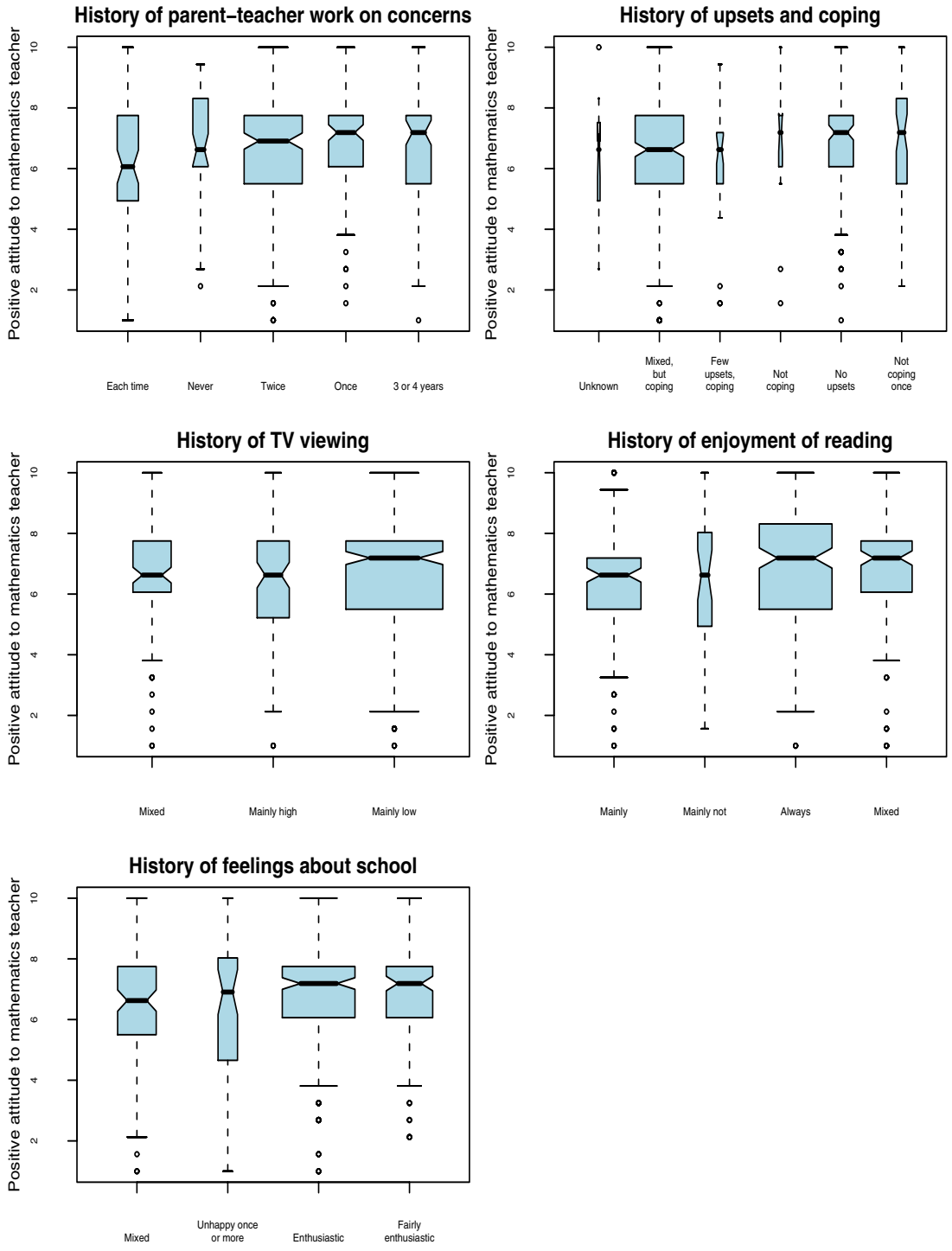
When maternal qualifications and family income scores were added to the model above, maternal qualifications contributed statistically significantly to the model ($p = 0.0265$). The model accounted for five percent of the variability in positive attitude to the English teacher score.

Positive attitude to mathematics teacher

There were weak correlations between the positive attitude to the mathematics teacher score and perseverance at age 12, being good/organised and peer social-emotional age 5 ($r = 0.14$, 0.13 and –0.21, respectively).

There were no statistically significant differences across the levels of history variables, shown in the boxplots in Figure 23.

Figure 23 **Positive attitude to mathematics teacher scores for five history variables**



Two percent of the variability in the positive attitude to mathematics teacher score was explained by the perseverance scores at 12. The model is shown in Table 78.

Table 78 **Model for positive attitude to mathematics teacher scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Perseverance 12	0.12	0.04	0.0026

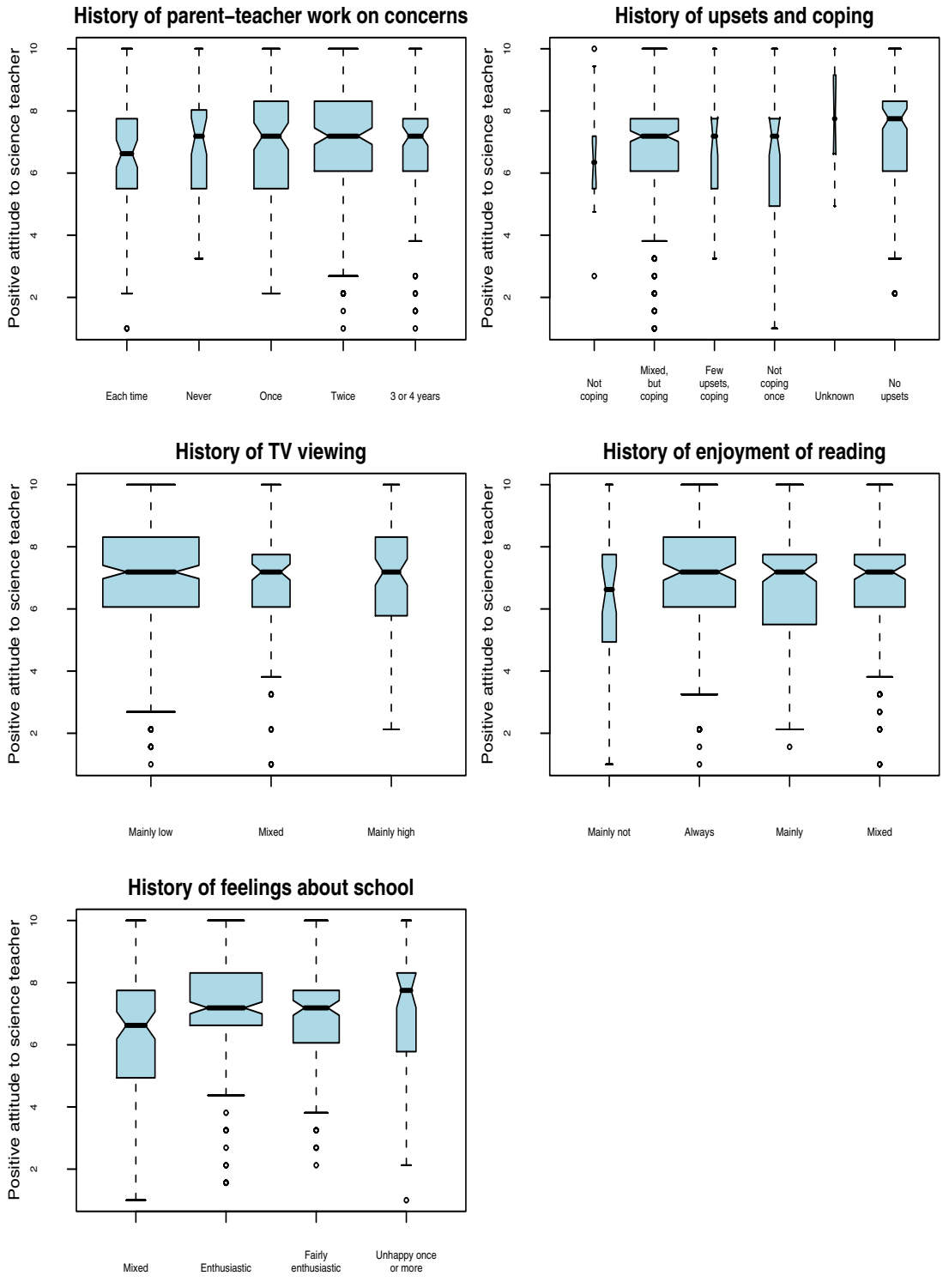
When maternal qualifications and family income scores were added to the model above, neither contributed statistically significantly to the model.

Positive attitude to science teacher

There were weak correlations between the positive attitude to the science teacher score and social skills with peers at age 8, curiosity at age 12, and the mean attitudinal composite score at 12 ($r = 0.12$, 0.14, and 0.13, respectively).

There were no statistically significant differences across the levels of history variables, shown in the boxplots in Figure 24.

Figure 24 **Positive attitude to science teacher scores for five history variables**



Two percent of the variability in the positive attitude to science teacher score was explained by the curiosity scores at 12 and social skills with peers at age 8. The model is shown in Table 79.

Table 79 **Model for positive attitude to science teacher scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Curiosity 12	0.11	0.05	0.0139
Social skills with peers 8	0.16	0.08	0.0389

When maternal qualifications and family income scores were added to the model above, neither contributed statistically significantly to the model.

Positive learning environment in English

There were weak correlations between the positive learning environment in English score and eight of the explanatory variables. These variables are listed in Table 80.

Table 80 **Variables correlated with positive learning environment in English scores**

Explanatory variables	Positive correlations
Social skills with adults age 6	0.22
Social skills with peers age 6	0.19
Perseverance age 12*	0.16
Mean attitudinal composite age 12	0.16
Individual responsibility age 12	0.15
Communication age 6	0.15
Curiosity age 12	0.13
Social skills with peers age 12	0.14

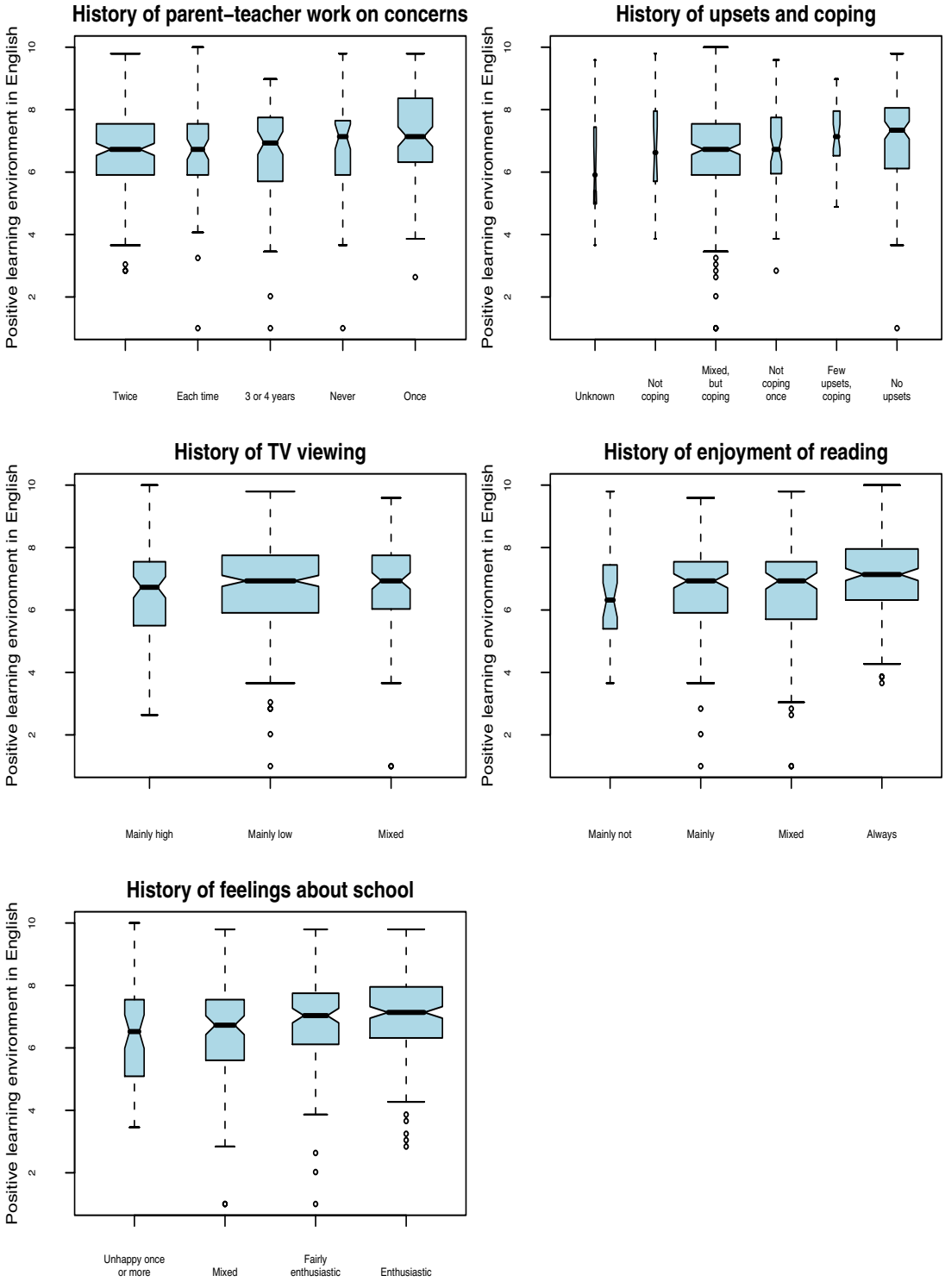
* Variables included in model below

Family income at 14 accounted for a significant amount of the variation in the positive learning environment in English score. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 was added to the model.

- History of enjoyment of reading ($p = 0.0194$, $R^2 = 1$ percent)
- History of feelings about school ($p = 0.0032$, $R^2 = 2$ percent)

Neither was significant in the larger model (Table 81). Boxplots for all the history variables are shown in Figure 25.

Figure 25 **positive learning environment in English scores for five history variables**



Two percent of the variability in the positive learning environment in English score was explained by the perseverance scores at 12. The model is shown in Table 81.

Table 81 **Model for positive learning environment in English scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variable			
Perseverance 12	0.11	0.03	0.0005

When maternal qualifications and family income scores were added to the model above, family income at age 14 contributed statistically significantly to the model ($p = 0.0069$), which then accounted for four percent of the variability in positive learning environment in English.

Positive learning environment in mathematics and science

All correlations between the explanatory variables and the positive learning environment in *mathematics* score were less than 0.12 (disregarding the sign of the correlation). The same was true for the positive learning environment in *science* score. None of the one-way ANOVAs for the history factors were statistically significant for either score. The variability in these scores is not accounted for by the explanatory variables used in this series of models.

Parental perceptions of the students' self-efficacy

The final three variables discussed are all based on parent responses. It is worth noting that these variables, but none of those based on teacher responses, show associations with earlier parental responses about upsets in the student's life and how they were coping with them.

There were weak correlations between the parental perceptions of the students' self-efficacy score and 29 of the explanatory variables. These variables are listed in Table 82.

Table 82 **Variables correlated with parental perceptions of the students' self-efficacy scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Perseverance age 12*	0.32		
Mean attitudinal composite age 10	0.32		
Mean attitudinal composite age 12	0.31	Difficult*	0.31
Individual responsibility age 10	0.30		
Mean attitudinal composite age 8	0.29		
Individual responsibility age 12	0.28		
Individual responsibility age 8	0.28		
Good/organised	0.27		
Perseverance age 8	0.27		
Social skills with teachers age 10*	0.27		
Perseverance age 6	0.27		
Social skills with peers age 10	0.26		
Social skills with peers age 6	0.26		
Social skills with peers age 12	0.24		
Social skills with peers age 8	0.24		
Perseverance age 10	0.24		
Social skills with adults age 6	0.24		
Communication age 6	0.24		
Social skills with adults age 8	0.23		
Social skills with teachers age 12	0.21		
Peer social-emotional age 5	0.21		
Curiosity age 12	0.19		
Extrovert	0.19		
Communication age 5	0.18		
Inquisitiveness age 5	0.18		
Curiosity age 10	0.16		
Perseverance age 5	0.16		
Adult social-emotional age 5	0.14		

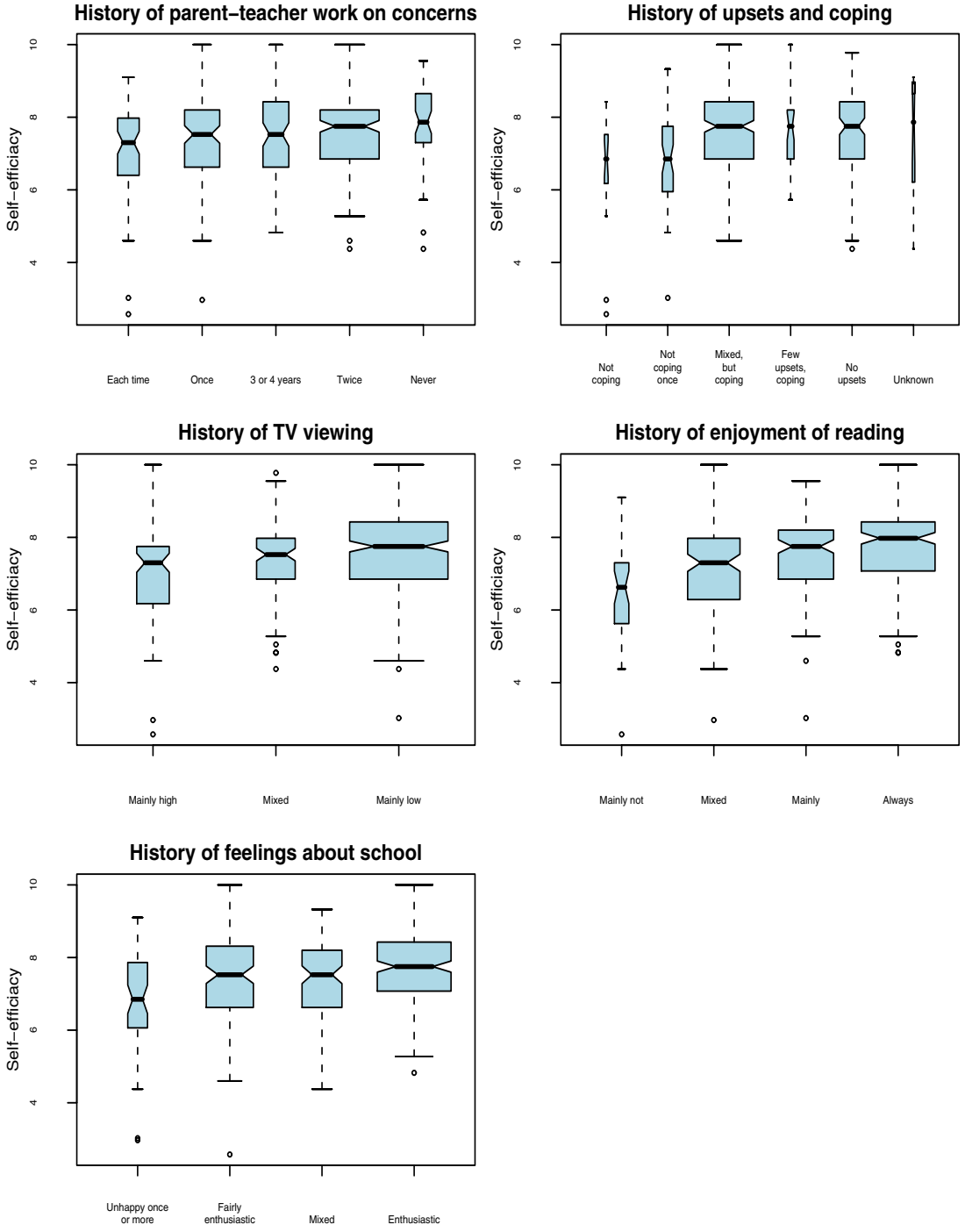
* Variables included in model below

Family income at 14, family income at 5, and maternal qualifications accounted for a significant amount of the variation in the self-efficacy score. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after maternal qualifications and family income at age 5 or 14 were added to the model.

- History or parents and teachers working together on concerns ($p = 0.0029$, $R^2 = 3$ percent)
- History of upsets and coping with them ($p < 0.0001$, $R^2 = 6$ percent)
- History of TV watching ($p = 0.0003$, $R^2 = 3$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 10$ percent)
- History of feelings about school ($p < 0.0001$, $R^2 = 5$ percent)

History of upsets and coping with them, of TV watching, and of enjoyment of reading were still significant in the larger model (Table 83). The boxplots in Figure 26 show the differences for all the history variables.

Figure 26 **Parental perceptions of the students' self-efficacy scores for five history variables**



Twenty percent of the variability in the parental perceptions of the students' self-efficacy score was explained by perseverance at 12, social skills with teachers scores at 10, the difficult score, history of TV watching, history of upsets and coping with them, and history of enjoyment of reading. The model is shown in Table 83.

Table 83 **Model for parental perceptions of the students' self-efficacy scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Social skills with teachers 10	0.07	0.03	0.0217
Perseverance 12	0.07	0.03	0.0213
Difficult	-0.17	0.08	0.0395
History variables			
History of enjoyment of reading			0.0051
Mainly yes/qualified yes	-0.15	0.12	0.2201
Mixed responses	-0.33	0.13	0.0112
Two or more no	-0.70	0.22	0.0012
History of TV watching			0.0520
Mixed	-0.05	0.12	0.6962
Mainly high	-0.30	0.13	0.0202
History of upsets and coping			0.0008
Mixed, but coping	-0.03	0.12	0.7825
Few upsets, coping	-0.12	0.21	0.5523
Not coping once	-0.63	0.17	0.0003
Not coping	-0.70	0.27	0.0088

When maternal qualifications and family income scores were added to the model above, family income at age 5 contributed significantly to the model (p = 0.0098), which then accounted for 23 percent of the variability in parental perceptions of the students' self-efficacy score. Social skills with teachers 10 and difficult scores no longer contributed significantly to the model.

Parental perceptions of the students' responsibility

There were weak correlations between the parental perceptions of the students' self-efficacy score and 28 of the explanatory variables. These variables are listed in Table 84.

Table 84 **Variables correlated with parental perceptions of the students' responsibility scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Perseverance age 12*	0.35		
Mean attitudinal composite age 12	0.32		
Individual responsibility age 8*	0.32		
Mean attitudinal composite age 10	0.31		
Mean attitudinal composite age 8	0.31		
Perseverance age 8	0.31		
Perseverance age 10	0.30		
Individual responsibility age 10	0.28		
Individual responsibility age 12	0.27		
Perseverance age 6	0.27	Difficult	0.25
Social skills with teachers age 10	0.22		
Social skills with peers age 8	0.21		
Communication age 6	0.21		
Good/organised	0.20		
Social skills with peers age 10	0.20		
Social skills with adults age 8	0.20		
Social skills with teachers age 12	0.20		
Curiosity age 12	0.20		
Social skills with peers age 6	0.20		
Social skills with adults age 6	0.19		
Social skills with peers age 12	0.18		
Extrovert	0.16		
Inquisitiveness age 6	0.16		
Curiosity age 10	0.15		
Perseverance age 5	0.15		
Peers social-emotional age 5	0.15		
Curiosity age 8	0.13		

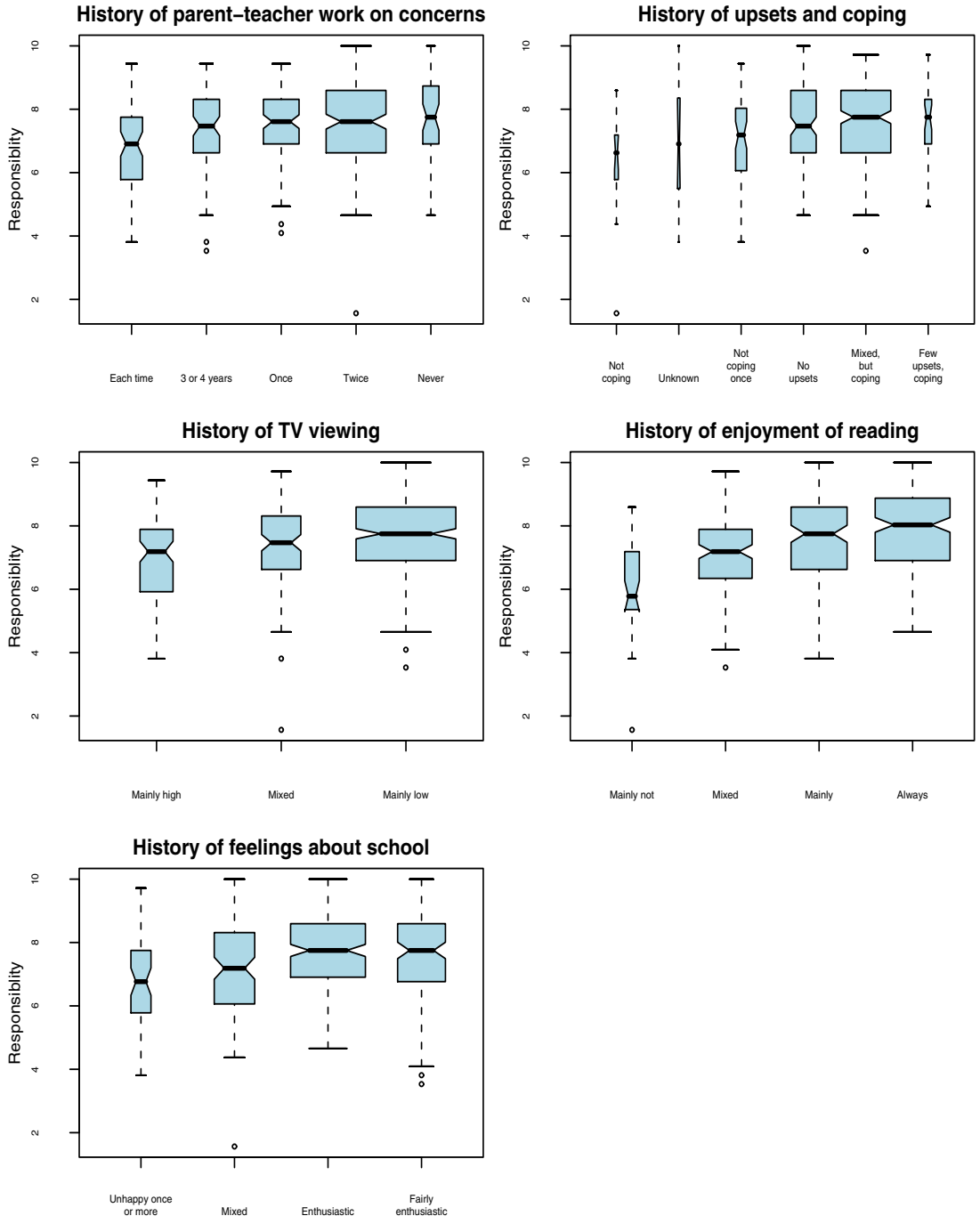
* Variables included in model below

Family income at 14, family income at 5, and maternal qualifications accounted for a significant amount of the variation in the responsibility score. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after maternal qualifications and family income at age 5 or 14 were added to the model.

- History or parents and teachers working together on concerns ($p = 0.0005$, $R^2 = 3$ percent)
- History of upsets and coping with them ($p = 0.0012$, $R^2 = 3$ percent)
- History of TV watching ($p = 0.0002$, $R^2 = 3$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 12$ percent)
- History of feelings about school ($p < 0.0001$, $R^2 = 4$ percent)

History variables of upsets and coping with them, of TV watching, and of enjoyment of reading were still significant in the larger model (Table 85). The boxplots in Figure 27 show the differences for all the history variables

Figure 27 **Parental perceptions of the students' responsibility scores for five history variables**



Twenty percent of the variability in the parental perceptions of the students' responsibility score was explained by the model, which is shown in Table 85.

Table 85 **Model for parental perceptions of the students' responsibility scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Individual responsibility 8	0.10	0.03	0.0039
Perseverance 12	0.11	0.03	0.0006
History variables			
History of enjoyment of reading			0.0011
Mainly yes/qualified yes	-0.11	0.14	0.4442
Mixed responses	-0.36	0.15	0.0142
Two or more no	-0.93	0.25	0.0002
History of TV watching			0.0314
Mixed	-0.12	0.14	0.4010
Mainly high	-0.39	0.15	0.0086
History of upsets and coping			0.0483
Mixed, but coping	0.03	0.13	0.8453
Few upsets, coping	-0.04	0.23	0.8541
Not coping once	-0.46	0.20	0.0199
Not coping	-0.59	0.30	0.0523

When maternal qualifications and family income scores were added to the model above, neither contributed significantly to the model.

Parental perceptions of the students' self-confidence

There were weak correlations between the parental perceptions of the students' self-confidence score and 23 of the explanatory variables. These variables are listed in Table 86.

Table 86 **Variables correlated with parental perceptions of the students' self-confidence scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Communication age 5	0.25		
Mean attitudinal composite age 10	0.23		
Curiosity age 10*	0.23		
Curiosity age 12	0.22		
Mean attitudinal composite age 8	0.21		
Social skills with teachers age 10	0.21		
Social skills with adults age 8*	0.21		
Mean attitudinal composite age 12	0.20		
Inquisitiveness age 6	0.20		
Communication age 6	0.20		
Curiosity age 8	0.19		
Perseverance age 6	0.19		
Social skills with adults age 6	0.19		
Perseverance age 5	0.19		
Adult social-emotional age 5	0.19		
Social skills with teachers age 12	0.18		
Extrovert	0.17		
Social skills with peers age 10	0.15	Introvert*	0.15
Perseverance age 12	0.14		
Individual responsibility age 8	0.14		
Good/organised	0.14		
Perseverance age 8	0.14		

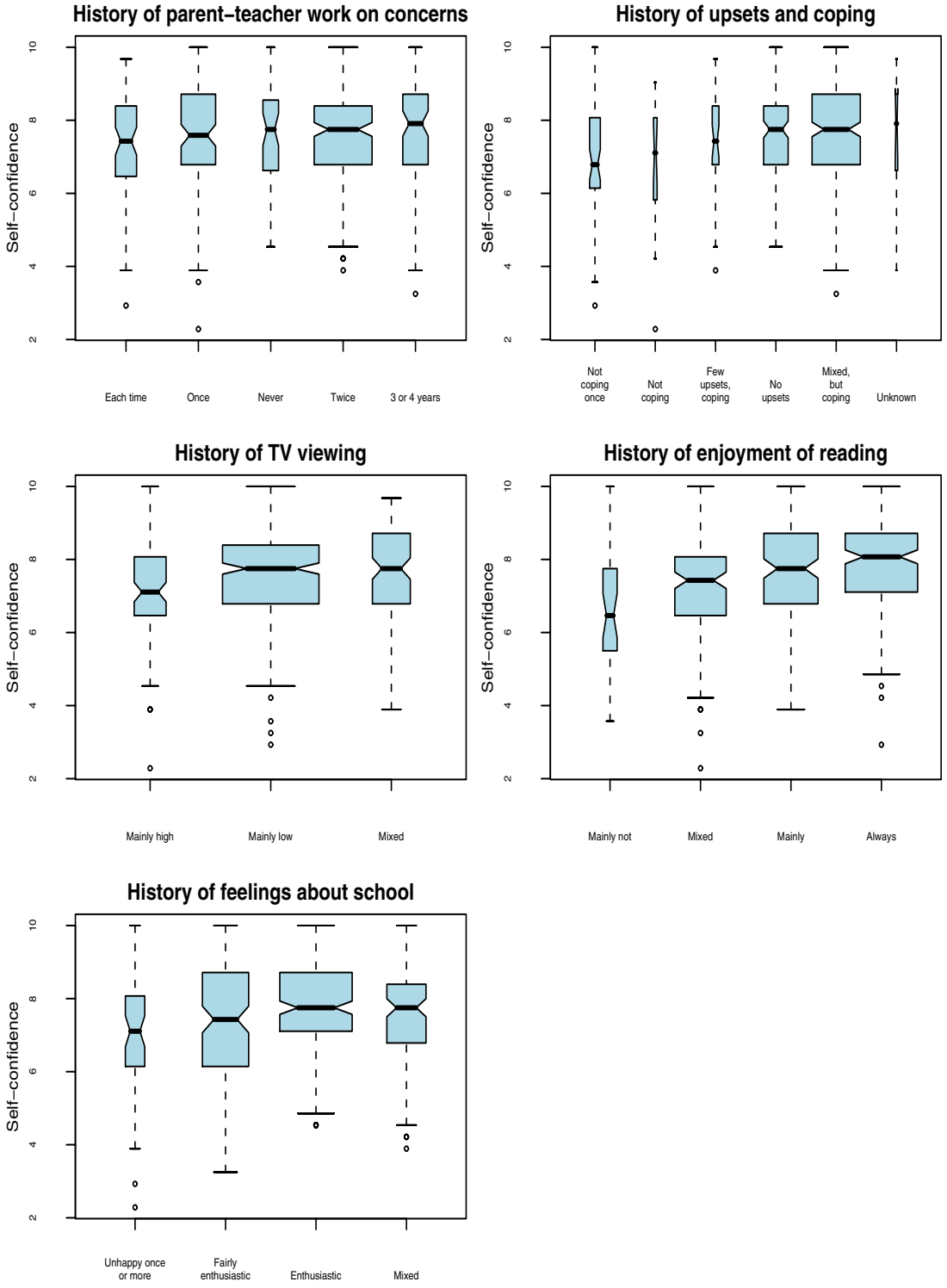
* Variables included in model below

Family income at 14, family income at 5, and maternal qualifications did not account for a significant amount of the variation in the self-confidence score. One-way ANOVA models were fitted for each of the history variables in turn, and those that were statistically significant are listed below.

- History of upsets and coping with them ($p = 0.0016$, $R^2 = 3$ percent)
- History of TV watching ($p = 0.0072$, $R^2 = 2$ percent)
- History of enjoyment of reading ($p < 0.0001$, $R^2 = 6$ percent)
- History of feelings about school ($p = 0.0010$, $R^2 = 3$ percent)

History of enjoyment of reading, and history of upsets and coping with them were still significant in the larger model (Table 87). Figure 28 shows the differences across all history variables.

Figure 28 **Parental perceptions of the students' self-confidence scores for five history variables**



Fourteen percent of the variability in the parental perceptions of the students' self-confidence score was explained by the model, which is shown in Table 87.

Table 87 **Model for parental perceptions of the students' self-confidence scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Social skills with adults 8	0.09	0.04	0.0197
Curiosity 10	0.13	0.03	0.0002
Introvert	-0.14	0.05	0.0108
History variables			
History of enjoyment of reading			0.0002
Mainly yes/qualified yes	0.001	0.15	0.9944
Mixed responses	-0.41	0.15	0.0073
Two or more no	-0.92	0.25	0.0003
History of upsets and coping			0.0150
Mixed, but coping	0.01	0.14	0.9261
Few upsets, coping	-0.36	0.25	0.1550
Not coping once	-0.56	0.21	0.0085
Not coping	-0.53	0.33	0.1069

When maternal qualifications and family income scores were added to the model above, maternal qualifications contributed significantly to the model ($p = 0.0237$), which then accounted for 16 percent of the variability in parental perceptions of the students' self-confidence score. History of TV watching was no longer statistically significant.

Attendance

Attempts to use classification trees or linear discriminant analysis models to describe current attendance patterns were not successful. Cross-tabulations and chi-square tests were used to explore the relationship between current attendance patterns and the history factors groupings. The data suggested that there were associations between:

- **History of upsets and coping**: In the group of students with few upsets or no upsets, 65 percent were in the low absenteeism group and eight percent were in the high absenteeism group, while in the group that had at least one upset they had difficulty coping with, 48 percent were in the low absenteeism group and 25 percent were in the high absenteeism group.
- **Teacher value clusters at age 12**: In the cluster characterised as "difficult", 51 percent were in the low absenteeism group and 22 percent in the high absenteeism group. For the cluster characterised as "good" or organised, the corresponding percentages were 54 percent and five, respectively.

To investigate the relationship between current absenteeism rates and earlier competencies or factor scores, we divided the scores into quartile groups, and cross-tabulated these against current absenteeism rates. The trends for all or most of the competencies were similar, but the scores that showed a statistically significant association (the most marked) were:

- **Perseverance at age 8**: In the lowest quartile group, 45 percent were in the low absenteeism group and 22 percent were in the high absenteeism group. The corresponding percentages for the highest quartile group were 60 and four, respectively.
- **Perseverance at age 12**: In the lowest quartile group, 39 percent were in the low absenteeism group and 21 percent were in the high absenteeism group. The corresponding percentages for the highest quartile group were 57 and nine, respectively.
- **Mean attitudinal composite at age 12**: In the lowest quartile group, 40 percent were in the low absenteeism group and 20 percent were in the high absenteeism group. The corresponding percentages for the highest quartile group were 56 and nine, respectively.

See also Section 4, about page 45, where the relationship between current attendance and earlier cognitive competencies and mean social/attitudinal competencies is investigated.

Motivation

Attempts to use classification trees or linear discriminant analysis models to describe motivation clusters were not successful. Cross-tabulations and chi-square tests were used to explore the relationship between motivation clusters and the history factors groupings. No statistically significant associations were found.

To investigate the relationship between motivation clusters and earlier competencies or factor scores, we divided the scores into quartile groups, and cross-tabulated these against current absenteeism rates. The trends for most of the scores were similar, but those that were sufficiently marked that they showed a statistically significant association were:

- **Perseverance at age 8**: In the lowest quartile group, 13 percent were in the high motivation group and 52 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 33 and 26, respectively.
- **Individual responsibility at 8**: In the lowest quartile group, 20 percent were in the high motivation group and 45 percent in the low motivation group. The corresponding percentages for the highest quartile group were 30 and 24, respectively.
- **Social skills with adults at 8**: In the lowest quartile group, 20 percent were in the high motivation group and 46 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 32 and 31, respectively.
- **Mean social composite at 8**: In the lowest quartile group, 17 percent were in the high motivation group and 47 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 33 and 29, respectively.
- **Perseverance at age 10**: In the lowest quartile group, 19 percent were in the high motivation group and 44 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 39 and 24, respectively.
- **Social skills with teachers at 10**: In the lowest quartile group, 17 percent were in the high motivation group and 48 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 32 and 27, respectively.
- **Mean attitudinal composite at 10**: In the lowest quartile group, 15 percent were in the high motivation group and 51 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 34 and 24, respectively.
- **Perseverance at age 12**: In the lowest quartile group, 15 percent were in the high motivation group and 53 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 33 and 22, respectively.
- **Curiosity at age 12**: In the lowest quartile group, 13 percent were in the high motivation group and 49 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 37 and 25, respectively.
- **Individual responsibility at age 12**: In the lowest quartile group, 18 percent were in the high motivation group and 43 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 31 and 29, respectively.
- **Social skills with teachers at age 12**: In the lowest quartile group, 13 percent were in the high motivation group and 46 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 34 and 25, respectively.
- **Mean attitudinal composite at age 12**: In the lowest quartile group, 11 percent were in the high motivation group and 51 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 37 and 23, respectively.
- **Good/obedient at age 12**: In the lowest quartile group, 22 percent were in the high motivation group and 47 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 30 and 22, respectively.
- **Difficult at age 12**: In the lowest quartile group, 30 percent were in the high motivation group and 30 percent were in the low motivation group. The corresponding percentages for the highest quartile group were 17 and 49, respectively.

See also Section 4, about page 39, where the relationship between motivation and earlier cognitive competencies and mean social/attitudinal competencies is investigated.

7. Results: Research question 8

Research question 8: How are current attitudes to school, including motivation and engagement, problem-solving approaches, [family relationships] and competency levels at age 14 related to patterns of peer relations in and outside school, experiences of bullying, and perceptions of the school and class environment?

To answer this question we took a set of our factor scale variables (see Section 2) as explanatory variables:

- Supportive family (student trusts parent/s, parent/s are warm and loving to them, student feels close to family, family is mutually helpful and supportive)
- Close parent-child communication (the parent and child communicate well and have a close relationship)
- Family communicates well (student can tell family members about what they do, and what is worrying them, their parent/s know when they are upset, the family does interesting things together)
- Inclusive family (student is treated fairly, is comfortable with the family, the family is considerate, and help is given when needed)
- Family pressure (student feels parent/s are trying to change them, control them, worry about what they get up to, but do not share problems; student does not have enough privacy)
- Parent-child friction (parent wishes the student were more obedient, wants to change things about them, has concerns about their friends and how they behave, thinks they are a negative influence)
- Achievement and praise (being praised for achievements, and also having taken action in positive ways)
- Challenging schoolwork (subject teachers want students to work hard, and challenging things are learned in class)
- External markers (student measures progress at school by the extent to which they out-perform others)
- Internal markers (student measures progress at school by having worked a problem out, learning interesting things, understanding and thinking about things, doing their best)
- Positive attitude to English, Mathematics, or Science teacher (student likes them, thinks they are fair and understand student feelings)
- Positive learning environment in English, Mathematics or Science (student feels the teacher gives clear instructions and expectations, is helpful, is interested in the students, etc)
- Comparative learning environment (class teachers make comparisons, and gives positions in class)
- Disrupted learning environment (students don't listen to the teacher, behave distractingly, and the class is interrupted)
- Negative about English, Mathematics and Science (student plans to drop the subject, doesn't know how to do the work, and does not do well)
- Dissatisfaction (student feels left out, doesn't have enough freedom. is bored and irritable, doesn't have enough money, has conflicts with those around them, gets picked on)
- Solid friendships (student feels friends listen to them, respect them, are trustworthy, are liked by their parents, etc.)
- Friends with risky behaviour (friends smoke, drink alcohol or marijuana, wag school, get into trouble at school, have sex)
- Risky behaviour (student has drunk alcohol and/or done something they regretted while drunk, got in trouble with the police, had sex, been in a fight, got into trouble at school, etc.)

as well as eight of the cluster, history or other derived variables defined (see Section 2). The reference group for each is italicised:

- Bullying at age 14 (student either a bully; a victim; both; or *neither*)
- Adverse events (student was marginalised, alienated, has suffered loss or family problems; levels *none*, one item or incident, two or more items)
- Historical patterns of bullying (has been involved in bullying; has had at least 2 possible incidents of bullying reported; *has had no involvement in bullying*)
- Student leisure activities (clusters: sports players; *computer games players/those with no strong interests*; all-rounders, interested in reading, arts and sport; those with creative interests)
- Parental interests (those who read and are involved in the community; *those who prefer to watch TV and have low involvement in the community*; those with mixed interests; those who prefer to watch TV and have few interests)
- Subject choice clusters (*Technology, Arts, Māori*; Technology, Economics/Consumer Studies/Financial Literacy; Māori, Technology, Graphics/Design Technology, Supplementary Literacy/English; Technology, Arts, Information Technology, Supplementary Literacy/English, Other languages; Japanese, Graphics/Design Technology, Other languages; Arts, Māori; French, Information Technology, Economics/Consumer Studies/Financial Literacy, Text Information Management)
- Values (clusters: anchored/achieving; anchored; *standing out*).
- Financial situation (clusters: comfortable family situation; moderate family financial situation; *difficult family situation*).

We investigated how much of the variation in factor scale variables about attitude to school and achievement the variables listed above could explain. The "outcome" variables we used were:

- Absorbed in learning (student gets totally absorbed in their work, checks their work, work out problems in group, works with understanding, etc.)
- Confident in school (student feels they are treated as an individual, feel they belong and are safe, etc.)
- Engaged in school (student likes teachers and enjoys learning, feels the rules are fair, etc.)
- Disengaged in learning (student misbehaves in class, puts in minimal effort, etc.)
- Cognitive competency at age 14: the overall mean measure, and the three separate measures for reading comprehension, mathematics and logical problem-solving
- Overall achievement (subject teachers' ratings of how the student achieves relative to their peers)
- Attitudinal competency at age 14

and we also explored the extent to which membership of clusters defined by the cluster variable motivation could be predicted by the peer and family relations and student experience variables:

- Motivation (clusters: university/professional orientation, high faith in gains from school; less positive of gains from school and less sure of future goals; aiming for skilled/unskilled jobs, low conviction about gains from school).

The internal and external markers of achievement were both included as possible variables in all models, and more usually it was the external markers that were retained in the models. However, for the cognitive competencies, it can be argued that it is the internal markers that are more appropriate. In the results that follow, there are models for the cognitive competencies including both the internal markers (but not the external markers) and one including the external markers.

Learning outcomes

Mean cognitive competency

There were weak to moderate correlations between mean cognitive competency and 13 of the explanatory variables. These variables are listed in Table 88. The variables with positive correlation coefficients have higher values of the variable associated with higher competency scores, while those with negative correlation coefficients have higher values of the variable associated with lower competency scores.

Table 88 **Variables correlated with mean cognitive competency**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
External markers of achievement*	0.39		
Internal markers of achievement	0.38		
		Negative about Mathematics*	0.36
		Negative about Science	0.30
		Parent-child friction*	0.27
		Family pressure*	0.24
		Disrupted learning environment	0.22
		Negative about English	0.21
		Risky behaviour	0.21
Inclusive family	0.13	Friends with risky behaviour	0.16
Positive attitude to Science teacher	0.13	Comparative learning environment*	0.14

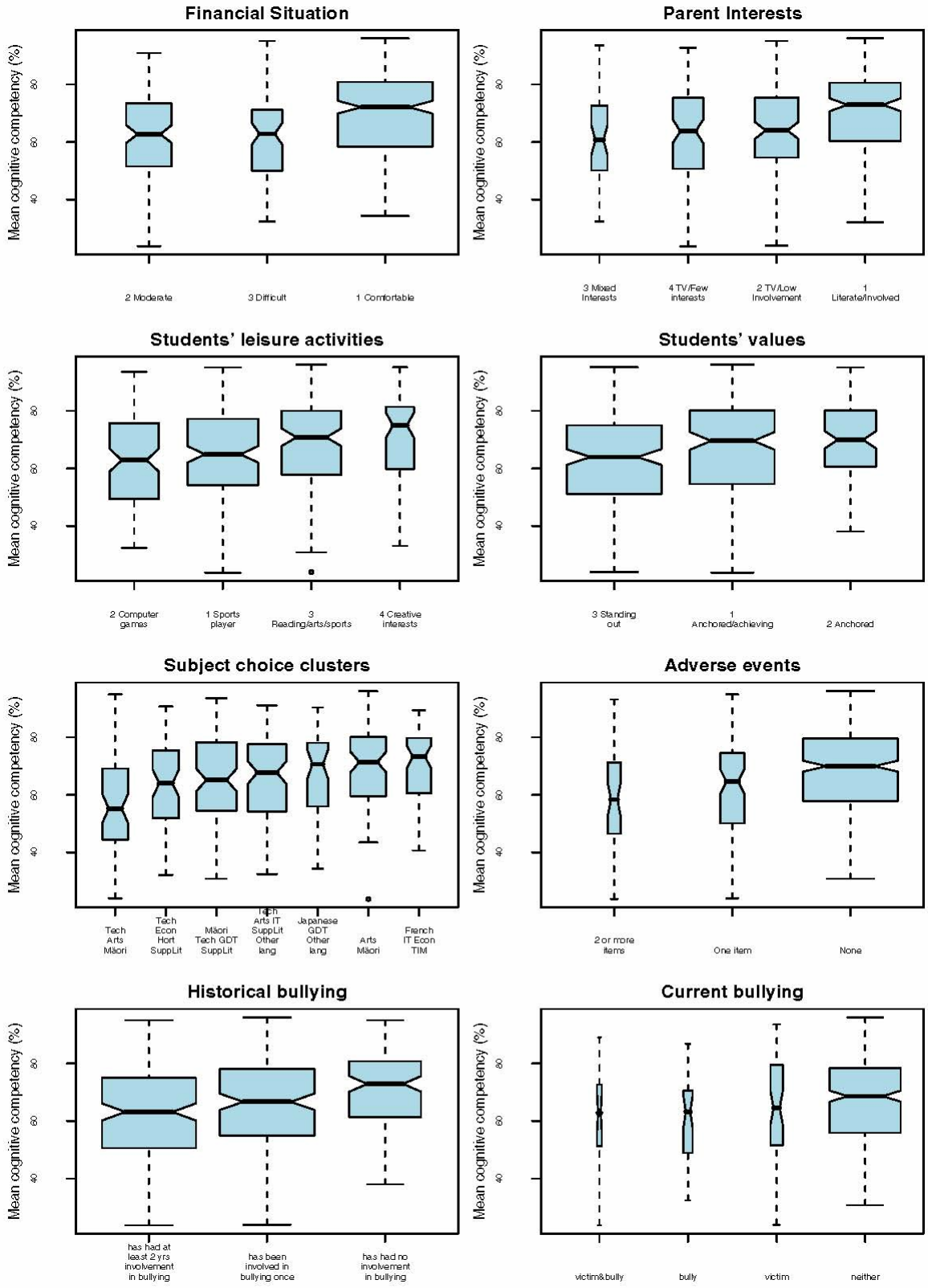
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the mean cognitive competency score, although the models fitted with family income at age 5 accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- Financial situation ($p < 0.0001$, $R^2 = 7$ percent)
- Parent interests ($p < 0.0001$, $R^2 = 5$ percent)
- Students' leisure activities ($p = 0.0018$, $R^2 = 3$ percent)
- Students' values ($p = 0.0002$, $R^2 = 3$ percent)
- Subject choices ($p = 0.0003$, $R^2 = 4$ percent)
- Adverse events ($p < 0.0001$, $R^2 = 5$ percent)
- History of bullying ($p < 0.0001$, $R^2 = 4$ percent)
- Current bullying ($p = 0.0248$, $R^2 = 1$ percent)

Financial situation, students' values, leisure activities, parent interests, and subject choice were still significant in the larger model (Table 89) that included external markers of achievement. All except students' values were also significant in the model that included internal markers of achievement (Table 90). The boxplots in Figure 29 show the differences for all the cluster and history variables.

Figure 29 **Mean cognitive competency for cluster and history groupings of eight variables**



Thirty-seven percent of the variability in the mean cognitive competency was explained by comparative learning environment, external markers of achievement, family pressure, being negative about Mathematics, parent-child friction, parent interests, the family financial situation, students' values, students' leisure activities, and subject choice clusters.

The model is shown in Table 89. The strongest association was with external markers of achievement and being negative about Mathematics.

Table 89 **Model for mean cognitive competency including external markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
External markers of achievement	0.23	0.03	< 0.0001
Negative about Mathematics	-0.17	0.03	< 0.0001
Parent-child friction	-0.11	0.05	0.0244
Comparative learning environment	-0.09	0.03	0.0075
Family pressure	-0.08	0.04	0.0306
Cluster variables			
Financial situation			0.0001
Moderate	-0.07	0.17	0.6819
Comfortable	0.46	0.16	0.0053
Students' values			0.0067
Anchored/achieving	0.25	0.13	0.0482
Anchored	0.46	0.15	0.0022
Students' leisure activities			0.0858
Sports player	-0.05	0.15	0.7584
Reading/arts/sports	0.18	0.16	0.2572
Creative interests	0.38	0.19	0.0544
Parent interests			0.0168 [a]
Mixed interests	-0.20	0.21	0.3362
TV/Few interests	-0.15	0.17	0.3818
Literate/Involved	0.27	0.14	0.0546
Subjects likely to include			0.0197
Technology, Economics/Consumer studies/etc, Horticulture, Supplementary literacy/English	0.14	0.23	0.5367
Japanese, Graphic Design Technology, other languages	0.40	0.24	0.1041
Technology, Arts, Supplementary literacy/English, other languages	0.41	0.21	0.0521
Māori, Technology, Graphic Design Technology, Supplementary literacy/English	0.45	0.21	0.0291
French, Information technology, Economics/Consumer studies/etc, Text information management	0.51	0.23	0.0306
Arts and Māori	0.73	0.21	0.0006

[a] The significant difference is between the Literate/involved group and the Mixed interest group.

In a model that included internal markers of achievement, 31 percent of the variability in the mean cognitive competency was explained by internal markers of achievement, family pressure, being negative about Mathematics, parent-child friction, parent interests, the family financial situation, students' leisure activities, and subject choice clusters.

The model is shown in Table 90.

Table 90 **Model for mean cognitive competency including internal markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Internal markers of achievement	0.23	0.05	< 0.0001
Negative about Mathematics	-0.16	0.03	< 0.0001
Parent-child friction	-0.09	0.05	0.0559
Family pressure	-0.09	0.04	0.0173
Cluster variables			
Financial situation			0.0005
Moderate	-0.20	0.18	0.2745
Comfortable	0.34	0.17	0.0457
Students' leisure activities			0.0858
Sports player	-0.05	0.15	0.7584
Reading/arts/sports	0.18	0.16	0.2572
Creative interests	0.38	0.19	0.0544
Parent interests			0.0026
Mixed interests	-0.19	0.22	0.3822
TV/Few interests	-0.21	0.19	0.2336
Literate/Involved	0.33	0.14	0.0218
Subjects likely to include			0.0035
Technology, Economics/Consumer studies/etc, Horticulture, Supplementary literacy/English	0.33	0.24	0.1671
Japanese, Graphic Design Technology, other languages	0.45	0.25	0.0746
Technology, Arts, Supplementary literacy/English, other languages	0.58	0.22	0.0077
Māori, Technology, Graphic Design Technology, Supplementary literacy/English	0.58	0.21	0.0074
French, Information technology, Economics/Consumer studies/etc, Text information management	0.69	0.24	0.0055
Arts and Māori	0.91	0.22	< 0.0001

Would this model be improved by the addition of engaged in school, disengaged in learning, confident in school, or absorbed in learning? The short answer is "no". These variables are sufficiently closely correlated with the other independent variables that multicollinearity becomes a problem, or at least there is a problem with independent variables that are positively correlated with mean cognitive competency appearing in the model with negative coefficients.

Reading comprehension

There were weak to moderate correlations between reading comprehension and 13 of the explanatory variables. These variables are listed in Table 91.

Table 91 **Variables correlated with reading comprehension scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
External markers of achievement*	0.37		
Internal markers of achievement	0.35		
		Negative about Science*	0.30
		Negative about Mathematics*	0.29
		Parent-child friction	0.25
		Family pressure*	0.23
		Disrupted learning environment	0.21
		Risky behaviour	0.21
		Negative about English	0.20
Inclusive family	0.16	Comparative learning environment*	0.16
Solid friendships	0.15	Friends with risky behaviour	0.14

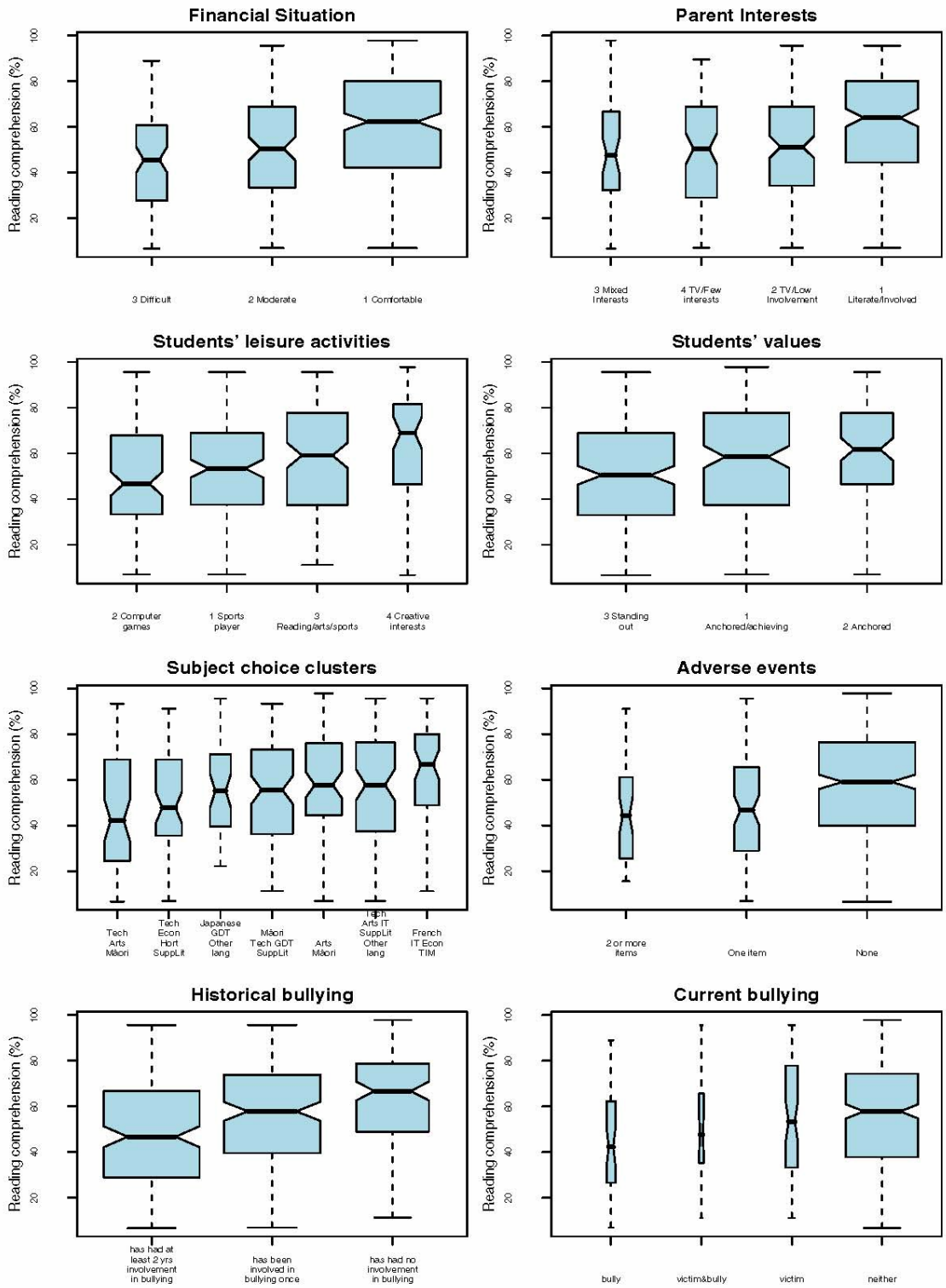
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the PAT reading comprehension score, although the models fitted with family income at age 5 accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- Financial situation ($p < 0.0001$, $R^2 = 6$ percent); indicative when family income is included in the model
- Parent interests ($p < 0.0001$, $R^2 = 4$ percent); no longer significant when maternal qualifications and family income are included in the model
- Students' leisure activities ($p = 0.0066$, $R^2 = 2$ percent); no longer significant when maternal qualifications and family income are included in the model
- Students' values ($p = 0.0003$ $R^2 = 3$ percent)
- Subject choices ($p = 0.0015$, $R^2 = 3$ percent); still just significant at the five percent level when maternal qualifications and family income are included in the model
- Adverse events ($p < 0.0001$, $R^2 = 4$ percent)
- History of bullying ($p < 0.0001$, $R^2 = 5$ percent)
- Current bullying ($p = 0.0364$, $R^2 = 1$ percent)

Financial situation, values, parent interests, and historical bullying were still significant in the larger model (Table 89) that included external markers of achievement. All except students' values were also significant in the model that included internal markers of achievement (Table 90), in which subject choice was also significant. The boxplots in Figure 30 show the differences for all the cluster and history variables.

Figure 30 **Reading comprehension scores for cluster and history groupings of eight variables**



A model including external markers of achievement explained 31 percent of the variability in reading comprehension score. The statistically significant explanatory variables are given in Table 92. The variable making the largest contribution to the reading comprehension score was external markers of achievement.

Table 92 **Model for reading comprehension including external markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
External markers of achievement	0.31	0.05	< 0.0001
Comparative learning environment	-0.16	0.05	0.0012
Negative about Mathematics	-0.15	0.05	0.0069
Negative about Science	-0.11	0.06	0.0465
Family pressure	-0.14	0.06	0.0183
Cluster variables			
Financial situation			0.0001
Moderate	0.34	0.27	0.2146
Comfortable	0.97	0.25	0.0001
History of bullying			0.0144
Been involved once	-0.22	0.23	0.3284
Been involved at least twice	-0.65	0.23	0.0052
Students' values			0.0059
Anchored/achieving	0.42	0.20	0.0391
Anchored	0.73	0.23	0.0020
Parent interests			0.0245
Mixed interests	0.21	0.32	0.5167
TV/Few interests	0.03	0.27	0.9014
Literate/Involved	0.59	0.22	0.0064

A model that included internal markers of achievement explained 26 percent of the variability in reading comprehension score. The statistically significant explanatory variables are given in Table 93. The variable making the largest contribution to the reading comprehension score was internal markers of achievement. Students' values was no longer included in the model, but subject choice was.

Table 93 **Model for reading comprehension including internal markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Internal markers of achievement	0.27	0.07	0.0002
Comparative learning environment	-0.12	0.05	0.0221
Negative about Mathematics	-0.14	0.06	0.0184
Negative about Science	-0.13	0.06	0.0285
Family pressure	-0.12	0.06	0.0370
Cluster variables			
Financial situation			0.0010
Moderate	0.14	0.28	0.6115
Comfortable	0.79	0.26	0.0024
History of bullying			0.0038
Been involved once	-0.26	0.23	0.2719
Been involved at least twice	-0.77	0.24	0.0014
Students' values			0.0059
Anchored/achieving	0.42	0.20	0.0391
Anchored	0.73	0.23	0.0020
Parent interests			0.0078
Mixed interests	0.15	0.34	0.6556
TV/Few interests	-0.07	0.28	0.7980
Literate/Involved	0.64	0.22	0.0042
Subjects likely to include			0.0448
Technology, Economics/Consumer studies/etc, Horticulture, Supplementary literacy/English	0.32	0.37	0.3874
Japanese, Graphic Design Technology, other languages	0.52	0.39	0.1832
Technology, Arts, Supplementary literacy/English, other languages	0.83	0.34	0.0149
Māori, Technology, Graphic Design Technology, Supplementary literacy/English	0.72	0.33	0.02861
French, Information technology, Economics/ Consumer studies/etc, Text information management	1.06	0.38	0.0049
Arts and Māori	0.94	0.34	0.0060

Would this model be improved by the addition of engaged in school, disengaged in learning, confident in school, or absorbed in learning? Again, there was a problem with independent variables that are positively correlated with mean cognitive competency appearing in the model with negative coefficients.

Mathematics

There were weak to moderate correlations between mathematics score and 10 of the explanatory variables. These variables are listed in Table 94.

Table 94 **Variables correlated with mathematics scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
		Negative about Mathematics*	0.40
External markers of achievement*	0.36		
Internal markers of achievement	0.32	Negative about Science	0.28
		Parent-child friction*	0.25
		Family pressure*	0.22
		Disrupted learning environment	0.18
		Risky behaviour	0.18
		Negative about English	0.17
		Friends with risky behaviour	0.15

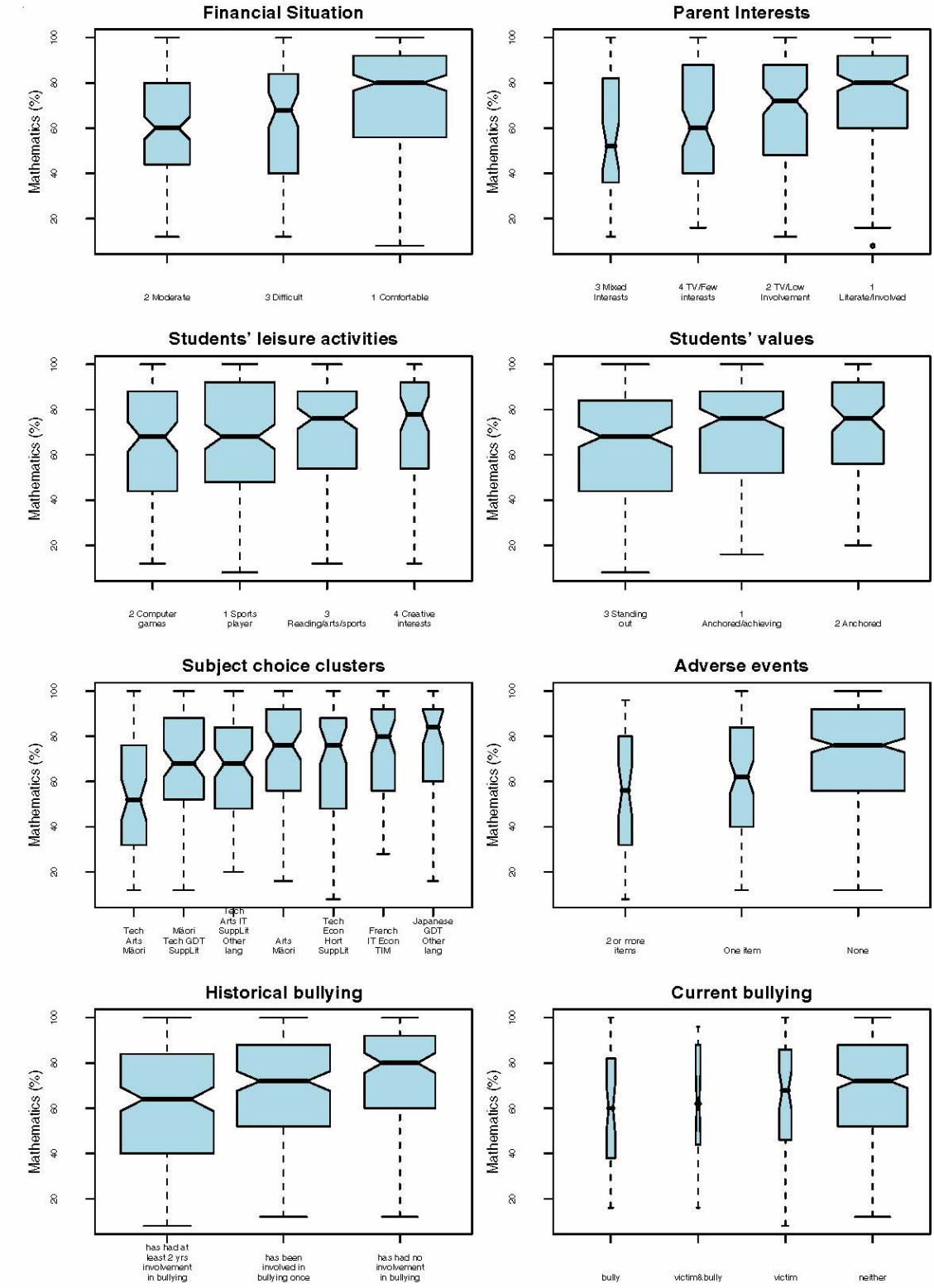
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the mathematics score, although the models fitted with family income at age 5 usually accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- Financial situation ($p < 0.0001$, $R^2 = 6$ percent)
- Parent interests ($p < 0.0001$, $R^2 = 4$ percent)
- Students' values ($p = 0.0010$, $R^2 = 2$ percent)
- Subject choices ($p < 0.0001$, $R^2 = 5$ percent)
- Adverse events ($p < 0.0001$, $R^2 = 5$ percent)
- History of bullying ($p < 0.0001$, $R^2 = 4$ percent)

Financial situation, values, parent interests, and subject choice were still significant in the larger model (Table 95) that included external markers of achievement. All except students' values were also significant in the model that included internal markers of achievement (Table 96), in which adverse events was also significant. The boxplots in Figure 31 show the differences for all the cluster and history variables.

Figure 31 **Mathematics scores for cluster and history groupings of eight variables**



A model that included external markers of achievement explained 34 percent of the variability in mathematics score. The statistically significant explanatory variables are given in Table 95. The variables making the largest contribution to the mathematics score were external markers of achievement and attitude to mathematics (being negative about mathematics).

Table 95 **Model for mathematics including external markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Negative about Mathematics	-0.33	0.05	< 0.0001
External markers of achievement	0.31	0.05	< 0.0001
Family pressure	-0.16	0.06	0.0109
Parent-child friction	-0.14	0.07	0.0543
Cluster variables			
Financial situation			0.0001
Moderate	-0.55	0.28	0.0497
Comfortable	0.37	0.26	0.1652
Students' values			0.0110
Anchored/achieving	0.29	0.21	0.1572
Anchored	0.73	0.24	0.0027
Parent interests			0.0093
Mixed interests	-0.69	0.34	0.0423
TV/Few interests	-0.40	0.28	0.1530
Literate/Involved	0.25	0.22	0.2649
Subjects likely to include			0.0078
Technology, Economics/Consumer studies/etc, Horticulture, Supplementary literacy/English	0.70	0.37	0.0585
Technology, Arts, Supplementary literacy/English, other languages	0.94	0.34	0.0056
Māori, Technology, Graphic Design Technology, Supplementary literacy/English	0.96	0.33	0.0040
French, Information technology, Economics/Consumer studies/etc, Text information management	1.05	0.38	0.0058
Japanese, Graphic Design Technology, other languages	1.14	0.39	0.0041
Arts and Māori	1.36	0.35	< 0.0001

A model that included internal markers of achievement explained 29 percent of the variability in mathematics score. The statistically significant explanatory variables are given in Table 96. The variables making the largest contribution to the mathematics score were internal markers of achievement and attitude to mathematics (being negative about mathematics).

Table 96 **Model for mathematics including internal markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Negative about Mathematics	-0.33	0.06	< 0.0001
Internal markers of achievement	0.26	0.07	0.0005
Family pressure	-0.16	0.06	0.0109
Parent-child friction	-0.18	0.07	0.0153
Cluster variables			
Financial situation			0.0007
Moderate	-0.59	0.29	0.0445
Comfortable	0.27	0.27	0.3230
Adverse events			0.0117
One item	-0.44	0.25	0.0770
Two or more items	-0.88	0.33	0.0074
Parent interests			0.0022
Mixed interests	-0.74	0.35	0.0366
TV/Few interests	-0.48	0.29	0.0952
Literate/Involved	0.31	0.23	0.1724
Subjects likely to include			0.0013
Technology, Economics/Consumer studies/etc, Horticulture, Supplementary literacy/English	1.02	0.38	0.0072
Technology, Arts, Supplementary literacy/English, other languages	1.11	0.35	0.0016
Māori, Technology, Graphic Design Technology, Supplementary literacy/English	1.15	0.34	0.0009
French, Information technology, Economics/Consumer studies/etc, Text information management	1.37	0.39	0.0005
Japanese, Graphic Design Technology, other languages	1.26	0.41	0.0022
Arts and Māori	1.60	0.36	< 0.0001

Would this model be improved by the addition of engaged in school, disengaged in learning, confident in school, or absorbed in learning? For mathematics, too, there was a problem with independent variables that are positively correlated with mean cognitive competency appearing in the model with negative coefficients.

Logical problem solving

There were weak correlations between logical problem solving score and nine of the explanatory variables. These variables are listed in Table 97.

Table 97 **Variables correlated with logical problem solving scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
		Negative about Mathematics*	0.32
Internal markers of achievement	0.26		
External markers of achievement*	0.25		
		Negative about Science	0.22
		Parent-child friction*	0.21
		Disrupted learning environment	0.19
		Dissatisfaction	0.14
		Comparative learning environment	0.14
		Family pressure	0.13

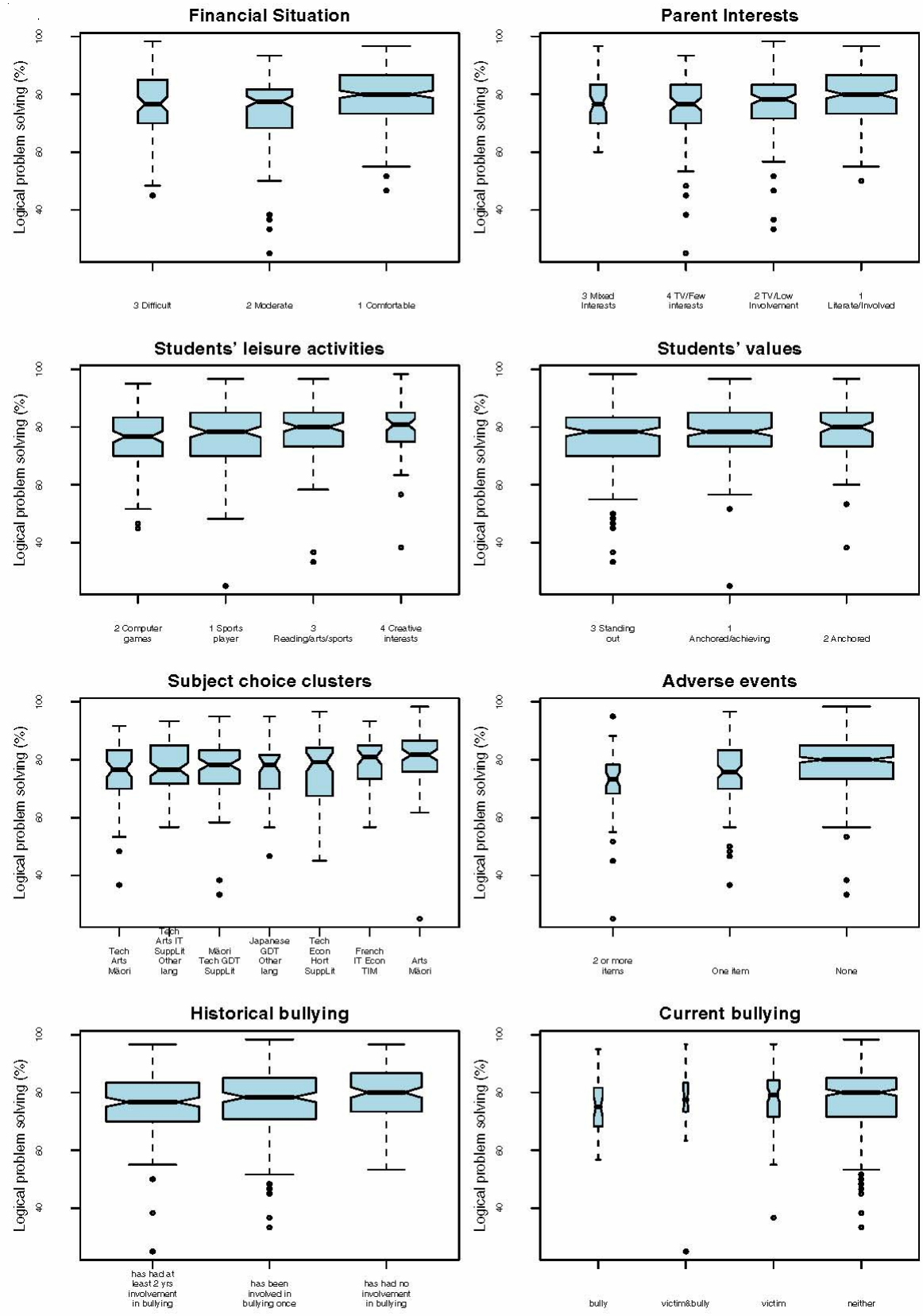
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the logical problem solving score, although the models fitted with family income at age 5 accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- Financial situation ($p < 0.0001$, $R^2 = 4$ percent)
- Parent interests ($p = 0.0019$, $R^2 = 3$ percent); no longer significant when maternal qualifications and family income are included in the model
- Students' leisure activities ($p = 0.0248$, $R^2 = 1$ percent); no longer significant when maternal qualifications and family income are included in the model
- Students' values ($p = 0.0210$ $R^2 = 1$ percent); no longer significant when maternal qualifications and family income are included in the model
- Subject choices ($p = 0.0413$, $R^2 = 2$ percent); no longer significant when maternal qualifications and family income are included in the model
- Adverse events ($p < 0.0001$, $R^2 = 4$ percent)

Financial situation and subject choice were still significant in the larger model (Table 98) that included external markers of achievement and in the model that included internal markers of achievement (Table 99). The boxplots in Figure 32 show the differences for all the cluster and history variables.

Figure 32 **Logical problem solving scores for cluster and history groupings of eight variables**



A model that included external markers of achievement explained 21 percent of the variability in the logical problem solving scores. The most important explanatory variables were negative about Mathematics and external markers of achievement. The statistically significant explanatory variables are given in Table 98.

Table 98 **Model for logical problem solving scores including external markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
External markers of achievement	0.10	0.02	< 0.0001
Negative about mathematics	-0.13	0.02	< 0.0001
Parent-child friction	-0.09	0.03	0.0029
Cluster variables			
Financial situation			0.0194 [a]
Moderate	-0.14	0.02	0.2374
Comfortable	0.12	0.11	0.2780
Subjects likely to include			0.0012
Technology, Arts, Supplementary literacy/English, other languages	0.05	0.14	0.7032
Technology, Economics/Consumer studies/etc, Horticulture, Supplementary literacy/English	-0.11	0.16	0.4633
Māori, Technology, Graphic Design Technology, Supplementary literacy/English	0.08	0.14	0.5740
French, Information technology, Economics/Consumer studies/etc, Text information management	0.06	0.16	0.7159
Japanese, Graphic Design Technology, other languages	-0.23	0.17	0.1626
Arts and Māori	0.41	0.15	0.0052

[a] The statistically significant difference was between those in a moderate situation and those in a comfortable situation.

A model that included internal markers of achievement explained 20 percent of the variability in the logical problem solving scores. The most important explanatory variables were negative about Mathematics and internal markers of achievement. The statistically significant explanatory variables are given in Table 99.

Table 99 **Model for logical problem solving scores including internal markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Internal markers of achievement	0.11	0.03	0.0003
Negative about mathematics	-0.12	0.02	< 0.0001
Parent-child friction	-0.08	0.03	0.0090
Cluster variables			
Financial situation			0.0113 [a]
Moderate	-0.19	0.12	0.1213
Comfortable	0.09	0.11	0.4049
Subjects likely to include			0.0027
Technology, Arts, Supplementary literacy/English, other languages	0.10	0.14	0.4830
Technology, Economics/Consumer studies/etc, Horticulture, Supplementary literacy/English	-0.02	0.16	0.8945
Māori, Technology, Graphic Design Technology, Supplementary literacy/English	0.13	0.14	0.3521
French, Information technology, Economics/Consumer studies/etc, Text information management	0.12	0.16	0.4496
Japanese, Graphic Design Technology, other languages	-0.15	0.17	0.3710
Arts and Māori	0.46	0.15	0.0019

[a] The statistically significant difference was between those in a moderate situation and those in a comfortable situation.

Would this model be improved by the addition of engaged in school, disengaged in learning, confident in school, or absorbed in learning? As for the other cognitive competencies, there was a problem with independent variables that are positively correlated with mean cognitive competency appearing in the model with negative coefficients.

Overall achievement

The cognitive competencies described above are the results of tests undertaken by the students. We also have a measure of the students' achievement that is based on the judgements of their three subject teachers. How do these different types of measures of achievement compare?

There were weak to moderate correlations between overall achievement and 16 of the explanatory variables. These variables are listed in Table 100.

Table 100 **Variables correlated with overall achievement**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
		Negative about Mathematics*	0.45
Internal markers of achievement	0.40	Negative about Science*	0.38
External markers of achievement*	0.35	Negative about English*	0.34
		Risky behaviour*	0.32
		Family pressure*	0.31
		Parent-child friction*	0.30
		Friends with risky behaviour	0.26
Positive attitude to Science teacher	0.19	Disrupted learning environment	0.19
Inclusive family	0.18		
Positive attitude to English teacher	0.18		
Positive learning environment in English	0.16		
Supportive family	0.16		
Positive learning environment in Science	0.14		

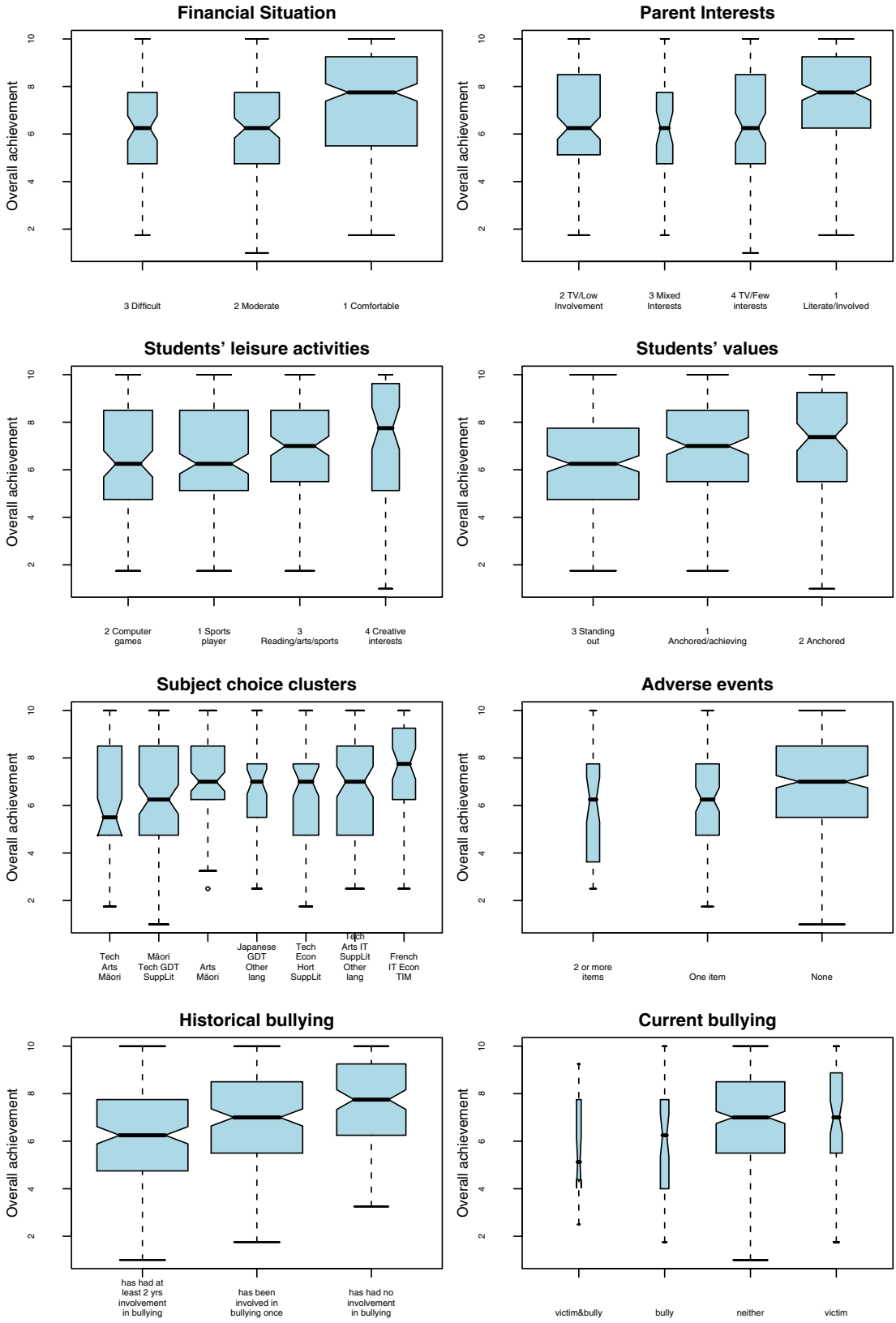
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the overall achievement score, although the models fitted with family income at age 5 usually accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- Financial situation ($p < 0.0001$, $R^2 = 5$ percent); no longer significant when maternal qualifications and family income were included in the model
- Parent interests ($p = 0.0003$, $R^2 = 3$ percent); no longer significant when maternal qualifications and family income were included in the model
- Students' leisure activities ($p = 0.0289$, $R^2 = 1$ percent); no longer significant when maternal qualifications and family income were included in the model
- Students' values ($p = 0.0007$, $R^2 = 3$ percent)
- Adverse events ($p = 0.0001$, $R^2 = 3$ percent)
- History of bullying ($p < 0.0001$, $R^2 = 5$ percent)
- Current bullying ($p = 0.0020$, $R^2 = 2$ percent)

Financial situation was still significant in the larger model (Table 101) that included external markers of achievement. Financial situation and history of bullying were significant in the model that included internal markers of achievement (Table 102). The boxplots in Figure 33 show the differences for all the cluster and history variables.

Figure 33 **Overall achievement for cluster and history groupings of eight variables**



Thirty-eight percent of the variability in overall achievement was explained by external markers of achievement; family pressure; being negative about English, Mathematics and Science; parent-child friction; risky behaviour; and the family financial situation.

The model is shown in Table 101. The strongest associations were with external markers of achievement, family pressure and being negative about Mathematics.

Table 101 **Model for overall achievement including external markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Negative about Mathematics	-0.29	0.05	< 0.0001
External markers of achievement	0.25	0.04	< 0.0001
Family pressure	-0.21	0.05	0.0002
Parent-child friction	-0.17	0.07	0.0083
Negative about English	-0.15	0.06	0.0093
Risky behaviour	-0.14	0.07	0.0507
Negative about Science	-0.11	0.05	0.0412
Cluster variables			
Financial situation			0.0102
Moderate	-0.14	0.24	0.9532
Comfortable	0.49	0.22	0.0280

Thirty-five percent of the variability in overall achievement was explained by internal markers of achievement; family pressure; being negative about Mathematics and Science; parent-child friction; risky behaviour, historical bullying and the family financial situation.

The model is shown in Table 102. The strongest associations were with internal markers of achievement, family pressure and being negative about Mathematics.

Table 102 **Model for overall achievement including internal markers of achievement**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Negative about Mathematics	-0.30	0.05	< 0.0001
Internal markers of achievement	0.26	0.07	< 0.0001
Family pressure	-0.21	0.05	< 0.0001
Parent-child friction	-0.16	0.07	0.0159
Negative about Science	-0.14	0.05	0.0092
Cluster variables			
Financial situation			0.0040
Moderate	-0.09	0.25	0.7224
Comfortable	0.50	0.23	0.0281
Historical bullying			0.0122
Been involved once	-0.04	0.21	0.8468
Been involved at least twice	-0.54	0.21	0.0118

When engaged in school, disengaged in learning, confident at school, and absorbed in learning were added to the two models above, engaged in learning added significantly to each, increasing the value of the adjusted R^2 to 40 and 37 percent, respectively. In the model that includes external markers of achievement, negative about English and risky behaviour were no longer significant, and in the model that includes internal markers of achievement, all variables remained significant.

Mean attitudinal composite

There were weak to moderate correlations between the mean attitudinal composite score and 22 of the explanatory variables. These variables are listed in Table 103.

Table 103 **Variables correlated with mean attitudinal composite scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Internal markers of achievement*	0.44	Risky behaviour*	0.42
		Negative about Mathematics*	0.40
		Negative about Science*	0.39
		Parent-child friction*	0.38
		Negative about English*	0.38
		Friends with risky behaviour	0.36
Positive attitude to English teacher*	0.29	Family pressure*	0.31
Inclusive family	0.28		
Supportive family	0.28		
Positive learning environment in English	0.28		
Positive attitude to Science teacher	0.28		
External markers of achievement*	0.25		
Positive learning environment in Science	0.23		
Family communicates well	0.22		
Positive attitude to Mathematics teacher	0.20	Disrupted learning environment	0.20
Solid friendships	0.19		
Challenging schoolwork	0.19		
Close parent-child communication	0.18		
Positive learning environment in Mathematics	0.17		

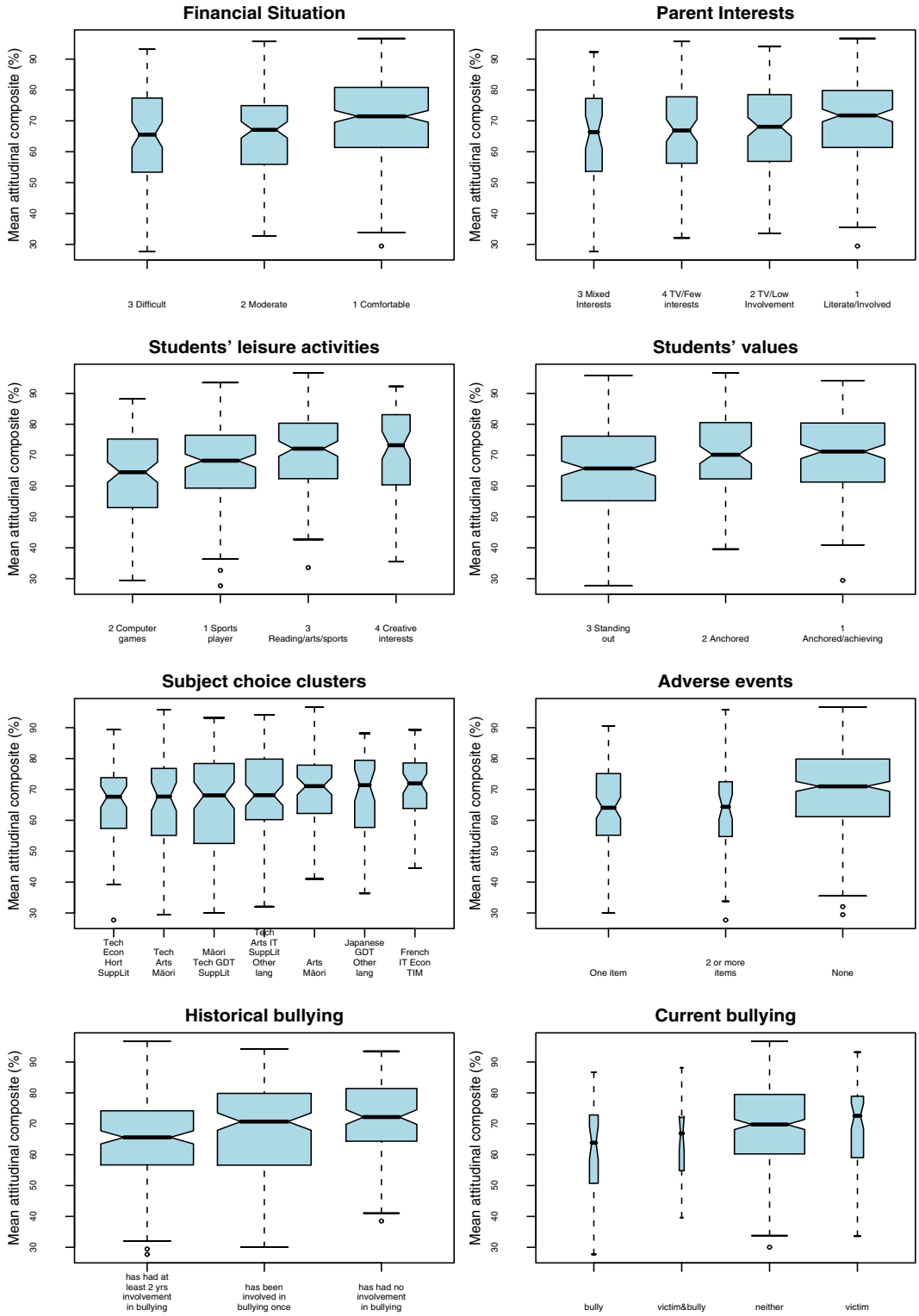
* Variables included in model below

Family income at 14, family income at 5 and maternal qualifications, accounted for a significant amount of the variation in the mean and social attitudinal composite score, although the models fitted with family income at age 14 usually accounted for slightly more of the variability in the scores. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after maternal qualifications and family income at 5 or 14 were added to the model.

- Financial situation ($p = 0.0001$, $R^2 = 3$ percent); no longer significant when maternal qualifications and family income were included in the model
- Parent interests ($p = 0.0712$, $R^2 = 2$ percent); no longer significant when maternal qualifications and family income were included in the model
- Students' leisure activities ($p = 0.0005$, $R^2 = 3$ percent)
- Students' values ($p < 0.0001$, $R^2 = 4$ percent)
- Adverse events ($p = 0.0001$, $R^2 = 3$ percent)
- History of bullying ($p < 0.0001$, $R^2 = 4$ percent)
- Current bullying ($p = 0.0017$, $R^2 = 3$ percent)

None of the cluster or history variables was still significant in the larger model (Table 104). The boxplots in Figure 34 show the differences for all the cluster and history variables.

Figure 34 **Mean attitudinal composite scores for cluster and history groupings of eight variables**



The model explained 39 percent of the variability in the mean attitudinal composite scores. The most important explanatory variables were parent-child friction and risky behaviour. The statistically significant explanatory variables are given in Table 104.

Table 104 **Model for mean attitudinal composite scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Risky behaviour	-0.21	0.05	< 0.0001
Parent-child friction	-0.21	0.04	< 0.0001
Negative about Mathematics	-0.11	0.03	0.0005
Internal markers of achievement	0.10	0.05	0.0565
Negative about Science	-0.08	0.03	0.0168
Negative about English	-0.08	0.04	0.0662
Family pressure	-0.08	0.03	0.0248
Positive attitude to English teacher	0.07	0.03	0.0500
External markers of achievement	0.06	0.03	0.0359

When engaged in school, disengaged in learning, confident at school, and absorbed in learning were added to the model, engaged in school was statistically significant in a model that accounted for 42 percent of the variability in the mean attitudinal composite score. Positive attitude to English teacher, negative about English, internal markers of achievement were no longer significant in the model.

If internal markers of achievement was retained in the model, this alternative model accounted for 41 percent of the variability in the mean attitudinal composite score, and parent-child friction, negative about English, family pressure, and positive attitude to English teacher were not longer significant in the model.

Engagement in learning

Absorbed in learning

There were weak to moderate correlations between the absorbed in learning score and 23 of the explanatory variables. These variables are listed in Table 105.

Table 105 **Variables correlated with absorbed in learning scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Internal markers of achievement*	0.58		
Positive learning environment in Science*	0.57		
Positive learning environment in English*	0.52	Negative about Science*	0.53
Positive attitude to Science teacher	0.50		
Positive learning environment in Mathematics*	0.50		
Challenging schoolwork	0.49	Negative about Mathematics*	0.47
Positive attitude to English teacher	0.46	Negative about English	0.46
Family communicates well*	0.45		
Positive attitude to Mathematics teacher	0.45		
Supportive family	0.41		
Inclusive family	0.39	Risky behaviour*	0.37
Solid friendships	0.26	Friends with risky behaviour	0.33
Praise and achievement	0.19	Disrupted learning environment	0.18
Close parent-child communication	0.18	Dissatisfaction	0.18
		Parent-child friction	0.18
		Family pressure	0.14

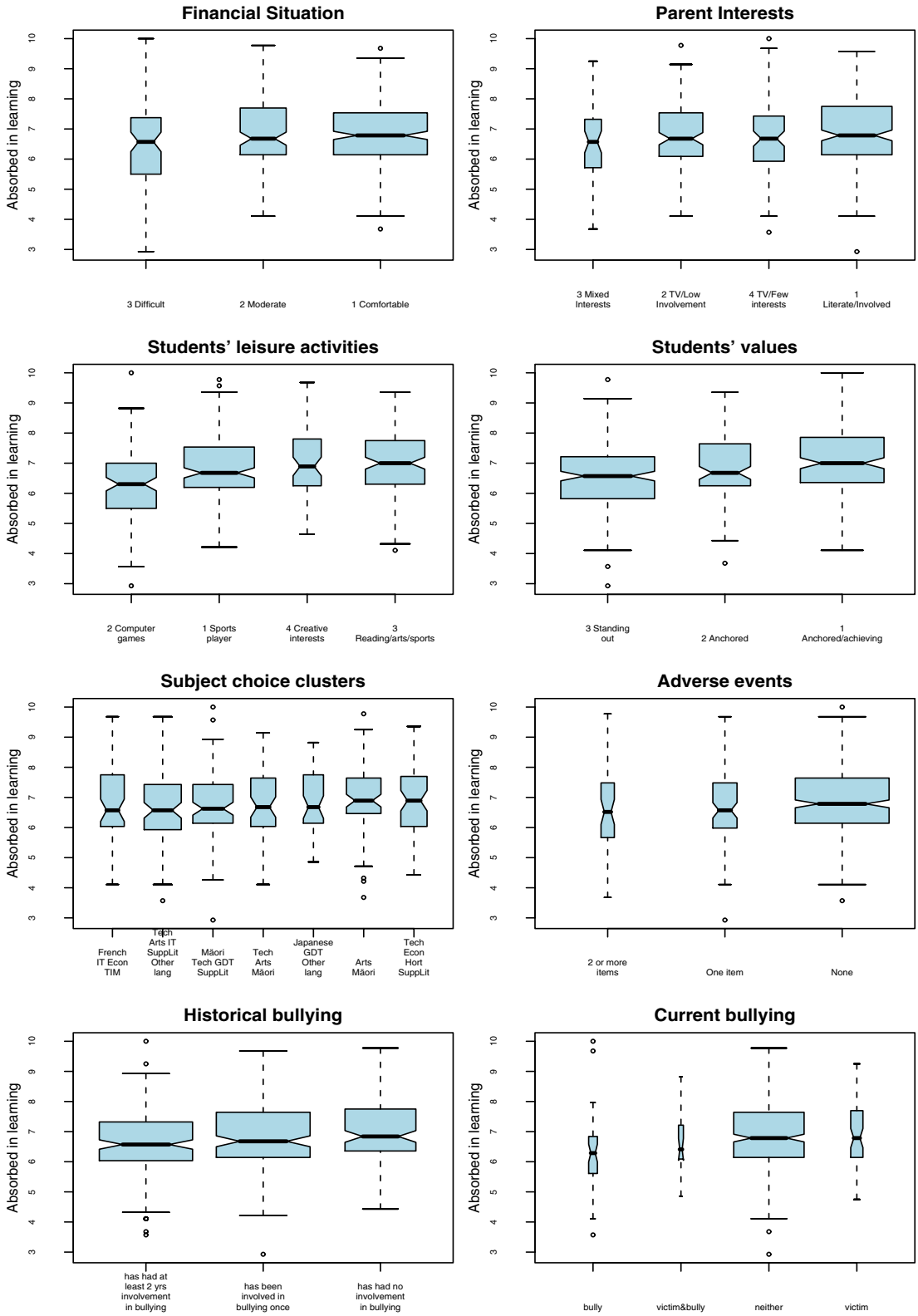
* Variables included in model below

Family income at 14, but neither family income at 5 nor maternal qualifications, accounted for a significant amount of the variation in the absorbed in learning score. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 5 and maternal qualifications were added to the model.

- Financial situation ($p = 0.0193$, $R^2 = 1$ percent)
- Students' leisure activities ($p < 0.0001$, $R^2 = 5$ percent)
- Students' values ($p < 0.0001$, $R^2 = 5$ percent)
- History of bullying ($p = 0.0382$, $R^2 = 1$ percent); only just significant at the five percent level when family income at 14 is added to the model
- Current bullying ($p = 0.0247$, $R^2 = 1$ percent)

Students' values was still significant in the larger model (Table 106). The boxplots in Figure 35 show the differences for all the cluster and history variables.

Figure 35 **Absorbed in learning scores for cluster and history groupings of eight variables**



Two thirds (66 percent) of the variability in the absorbed in learning score was explained by the model. The most important variables were: family communicates well, internal markers of achievement, and having a positive learning environment in English, Mathematics and Science. The statistically significant explanatory variables are given in Table 106.

Table 106 **Model for absorbed in learning scores**

Explanatory variables	**Parameter estimate**	**Standard error**	***p*-value**
Scale variables			
Internal markers of achievement	0.18	0.03	< 0.0001
Positive learning environment in Science	0.15	0.02	< 0.0001
Positive learning environment in Mathematics	0.14	0.02	< 0.0001
Positive learning environment in English	0.13	0.02	< 0.0001
Family communicates well	0.09	0.02	< 0.0001
Risky behaviour	-0.07	0.03	0.0111
Negative about Mathematics	-0.07	0.02	0.0018
Negative about Science	-0.06	0.02	0.0117
Cluster variable			
Students' values			0.0395
Anchored	0.02	0.08	0.7645
Anchored/achieving	0.17	0.07	0.0162

Confident at school

There were weak to moderate correlations between the confident at school score and all of the explanatory variables. The variables and correlation coefficients are listed in Table 107.

Table 107 **Variables correlated with confident at school scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Internal markers of achievement*	0.57		
Inclusive family*	0.49		
Supportive family	0.46		
Positive learning environment in English*	0.43	Negative about Science*	0.41
Solid friendships*	0.43	Negative about English	0.40
Positive attitude to Science teacher	0.40		
Positive learning environment in Science	0.39	Risky behaviour	0.33
Positive attitude to English teacher	0.39	Dissatisfaction*	0.32
Challenging schoolwork	0.38	Friends with risky behaviour	0.32
Family communicates well	0.37	Negative about Mathematics	0.32
Positive learning environment in Mathematics*	0.30	Family pressure	0.25
Positive attitude to Mathematics teacher	0.30	Disrupted learning environment	0.24
Praise and achievement	0.19	Parent-child friction	0.23
External markers of achievement	0.18		
Close parent-child communication	0.17	Comparative learning environment	0.16

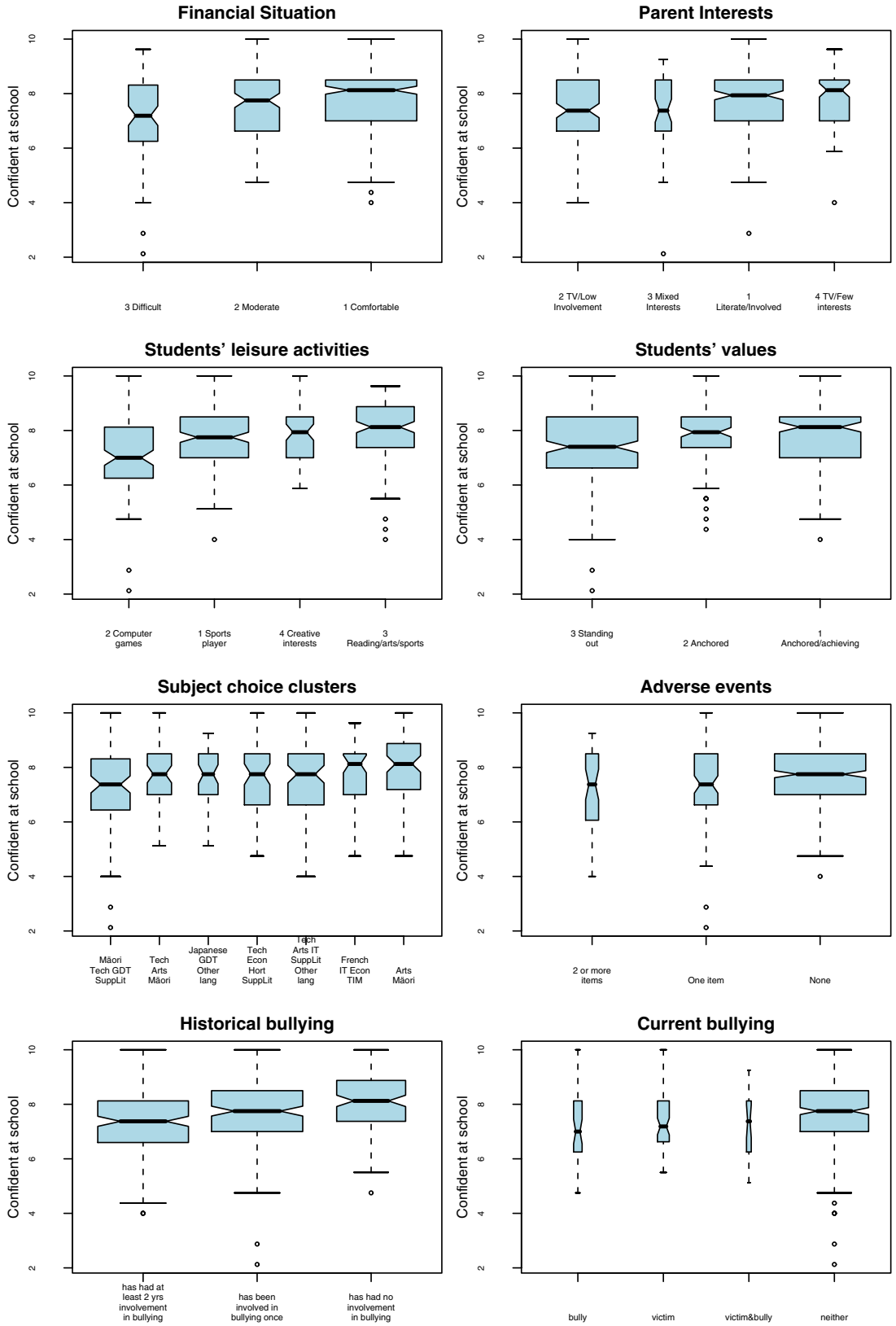
* Variables included in model below

Family income at 14, rather than family income at 5 or maternal qualifications, accounted for a significant amount of the variation in the confident at school score. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- Financial situation ($p = 0.0034$, $R^2 = 2$ percent)
- Parent interests ($p = 0.0145$, $R^2 = 2$ percent)
- Students' leisure activities ($p < 0.0001$, $R^2 = 6$ percent)
- Students' values ($p = 0.0073$, $R^2 = 2$ percent)
- Adverse events ($p = 0.0005$, $R^2 = 3$ percent)
- History of bullying ($p < 0.0001$, $R^2 = 6$ percent)
- Current bullying ($p = 0.0016$, $R^2 = 3$ percent)

History of bullying was still significant in the larger model (Table 108). The boxplots in Figure 36 show the differences for all the cluster and history variables.

Figure 36 **Confident at school scores for cluster and history groupings of eight variables**



The model explained 51 percent of the variability in confident at school scores, with the internal markers of achievement and solid friendship scores being the most important in the model. The statistically significant explanatory variables are given in Table 108.

Table 108 **Model for confident at school scores**

Explanatory variables	**Parameter estimate**	**Standard error**	***p*-value**
Scale variables			
Internal markers of achievement	0.29	0.04	< 0.0001
Solid friendships	0.21	0.04	< 0.0001
Dissatisfaction	-0.13	0.04	0.0003
Inclusive family	0.11	0.03	0.0015
Positive learning environment in English	0.11	0.03	0.0005
Negative about Science	-0.07	0.02	0.0025
Positive learning environment in Mathematics	0.04	0.02	0.0606
Cluster variable			
Historical bullying			0.0151
Been involved in bullying once	-0.16	0.10	0.1198
Been involved in bullying at least twice	-0.30	0.10	0.0038

Engaged in school

There were weak to moderate correlations between the engaged in school score and 23 of the explanatory variables. The variables and correlation coefficients are listed in Table 109.

Table 109 **Variables correlated with engaged in school scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Internal markers of achievement*	0.50	Risky behaviour*	0.54
Positive learning environment in English*	0.45	Negative about English*	0.51
Positive attitude to English teacher	0.45	Friends with risky behaviour	0.45
Inclusive family*	0.41	Negative about Mathematics*	0.41
Supportive family	0.40	Negative about Science	0.39
Positive attitude to Mathematics teacher	0.34		
Positive attitude to Science teacher	0.33		
Family communicates well	0.33		
Positive learning environment in Mathematics	0.32	Parent-child friction*	0.29
Positive learning environment in Science	0.30	Family pressure	0.29
Challenging schoolwork	0.27	Disrupted learning environment	0.28
Solid friendships	0.24	Dissatisfaction	0.24
Close parent-child communication	0.18	Comparative learning environment*	0.16

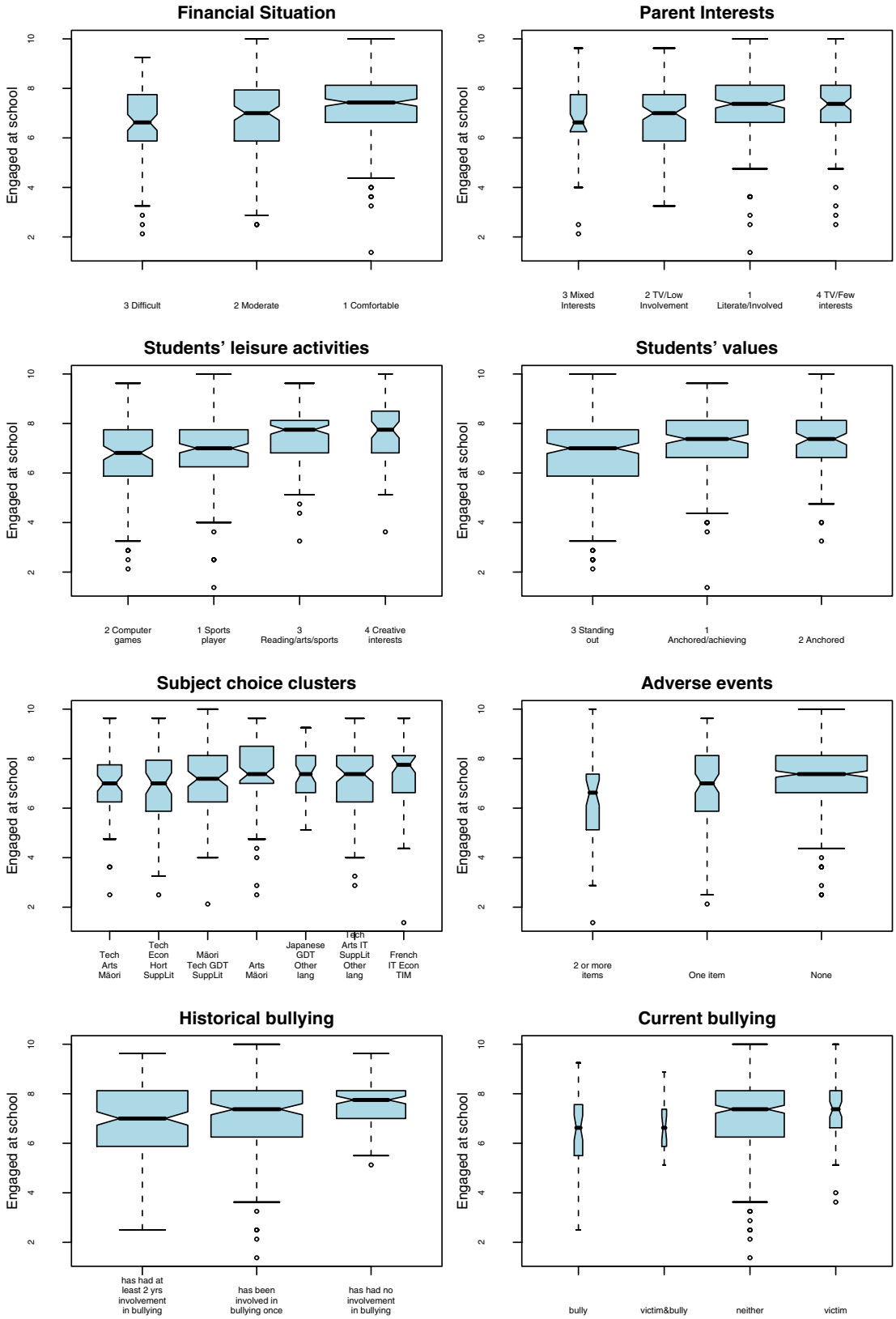
* Variables included in model below

Family income at 14 and maternal qualifications, rather than family income at 5, accounted for a significant amount of the variation in the engaged in school score. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- Financial situation ($p < 0.0001$, $R^2 = 4$ percent)
- Parent interests ($p = 0.0141$, $R^2 = 2$ percent)
- Students' leisure activities ($p < 0.0001$, $R^2 = 5$ percent)
- Students' values ($p < 0.0001$, $R^2 = 4$ percent)
- Adverse events ($p < 0.0001$, $R^2 = 5$ percent)
- History of bullying ($p < 0.0001$, $R^2 = 4$ percent)
- Current bullying ($p = 0.0007$, $R^2 = 3$ percent)

Parental interests and adverse events were still significant in the larger model (Table 110). The boxplots in Figure 37 show the differences for all the cluster and history variables.

Figure 37 **Engaged in school scores for cluster and history groupings of eight variables**



The model explained 55 percent of the variability in the engaged in school scores, with risky behaviour scores and positive learning environment in English contributing most significantly to the model. The statistically significant explanatory variables are given in Table 110.

Table 110 **Model for engaged in school scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Risky behaviour	-0.37	0.04	< 0.0001
Positive learning environment in English	0.19	0.04	< 0.0001
Negative about English	-0.16	0.04	< 0.0001
Negative about Mathematics	-0.13	0.03	< 0.0001
Internal markers of achievement	0.10	0.04	0.0128
Comparative learning environment	-0.07	0.02	0.0046
Inclusive family	0.07	0.04	0.0475
Parent-child friction	-0.07	0.04	0.0659
Cluster variables			
Parental interests			0.0215
Mixed interests	0.22	0.16	0.1814
TV/Few interests	0.30	0.13	0.0132
Literate/involved	0.33	0.11	0.0027
Adverse events			0.0101
One event	-0.02	0.12	0.8906
Two or more events	-0.45	0.15	0.0036

Disengaged in learning

There were weak to moderate correlations between the disengaged in learning score and 24 of the explanatory variables. The variables and correlation coefficients are listed in Table 111.

Table 111 **Variables correlated with disengaged in learning scores**

Explanatory variables	Positive correlations	Explanatory variables	Negative correlations
Disrupted learning environment*	0.50		
Negative about English*	0.46	Internal markers of achievement	0.42
Friends with risky behaviour*	0.45	Inclusive family	0.41
Risky behaviour*	0.43	Positive attitude to Science teacher*	0.39
Negative about Science	0.42	Positive learning environment in English	0.38
		Positive attitude to English teacher	0.38
		Supportive family	0.37
Comparative learning environment*	0.35	Positive learning environment in Science	0.35
Negative about Mathematics	0.35	Solid friendships	0.34
Family pressure	0.30	Family communicates well	0.33
		Positive attitude to Mathematics teacher*	0.33
Dissatisfaction	0.25	Challenging schoolwork	0.29
Parent-child friction	0.25	Positive learning environment in Mathematics	0.28
		Praise and achievement*	0.18
		Close parent-child communication	0.13

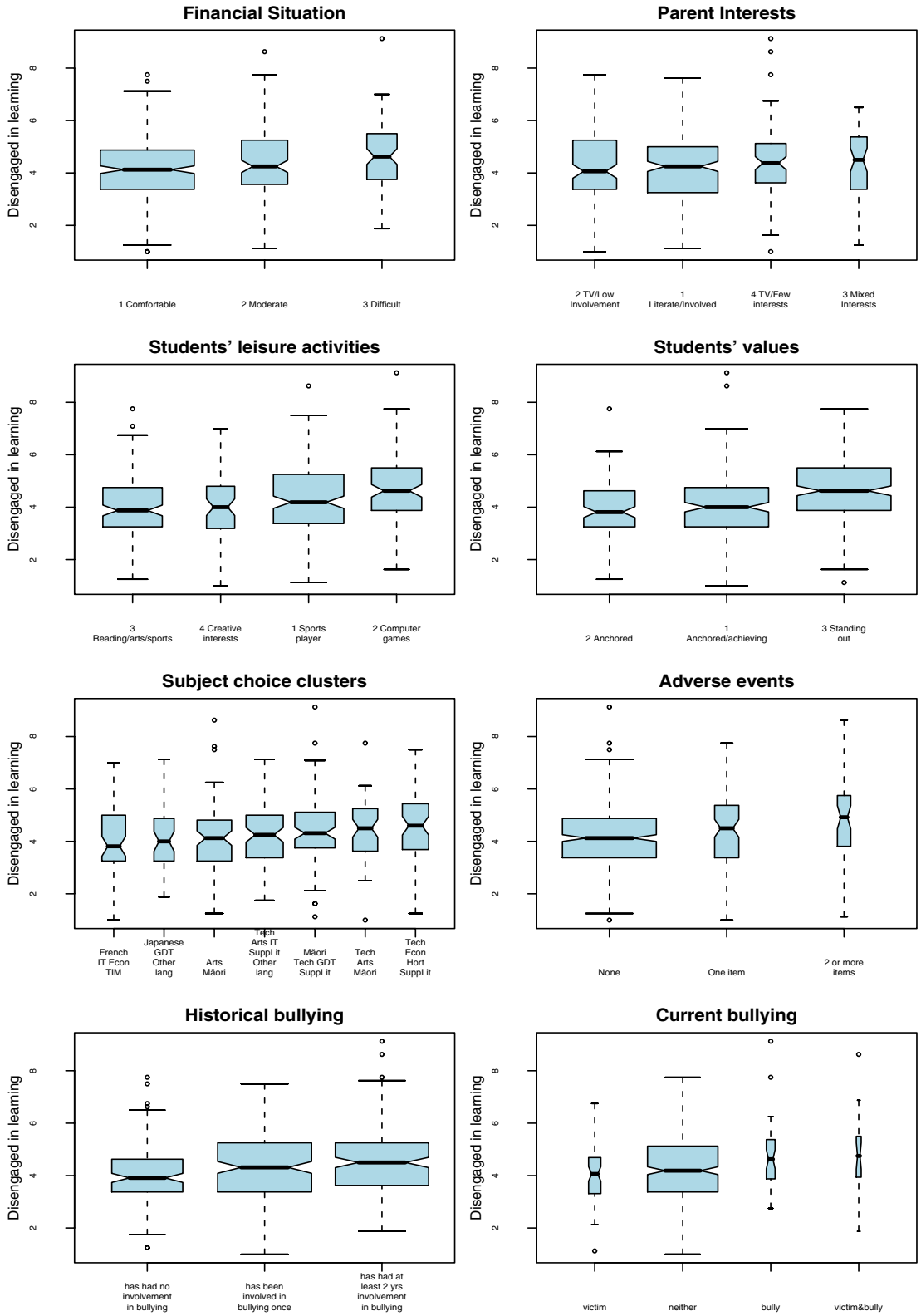
* Variables included in model below

Maternal qualifications, and to a lesser extent family income at 14, rather than family income at 5, accounted for a significant amount of the variation in the disengaged in learning score. One-way ANOVA models were fitted for each of the history and cluster variables in turn, and those that were statistically significant are listed below. Unless otherwise stated, they were still significant after family income at 14 and maternal qualifications were added to the model.

- Financial situation ($p = 0.0010$, $R^2 = 2$ percent)
- Students' leisure activities ($p < 0.0001$, $R^2 = 4$ percent)
- Students' values ($p < 0.0001$, $R^2 = 8$ percent)
- Adverse events ($p = 0.0006$, $R^2 = 3$ percent)
- History of bullying ($p = 0.0034$, $R^2 = 2$ percent)
- Current bullying ($p = 0.0045$, $R^2 = 2$ percent)

Students' values was still significant in the larger model (Table 112). The boxplots in Figure 38 show the differences for all the cluster and history variables.

Figure 38 **Disengaged in learning scores for cluster and history groupings of eight variables**



The model explained 58 percent of the variability in the disengaged in learning scores, with disrupted learning environment, risky behaviour, negative about English, and comparative learning environment scores contributing most significantly to the model. The statistically significant explanatory variables are given in Table 112.

Table 112 **Model for disengaged in learning scores**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Disrupted learning environment	0.20	0.03	< 0.0001
Risky behaviour	0.19	0.04	< 0.0001
Negative about English	0.17	0.03	< 0.0001
Comparative learning environment	0.15	0.02	< 0.0001
Praise and achievement	-0.10	0.03	0.0003
Positive attitude to Science teacher	-0.10	0.02	< 0.0001
Friends with risky behaviour	0.10	0.03	0.0003
Positive attitude to Mathematics teacher	-0.08	0.02	< 0.0001
Cluster variable			
Students' values			0.0060
Anchored/achieving	-0.26	0.09	0.0034
Anchored	-0.25	0.10	0.0138

Motivation

We attempted to predict motivation cluster membership in two ways: using a classification tree and using discriminant analysis. Neither method was able to predict membership particularly well; the correct classification rates for the two models were 59 percent for the classification tree and 60 percent for discriminant analysis, and the cross-classification rates were 48 percent for both models. The model classification rate is the rate achieved where all the data are used to form the model, and the model is used to predict group membership for all observations. The cross-classification rate is the rate achieved where models are formed leaving observations out, and are then used to predict group membership for the omitted observations. It is almost always lower than the model classification rate.

The variables that were useful in both models were:

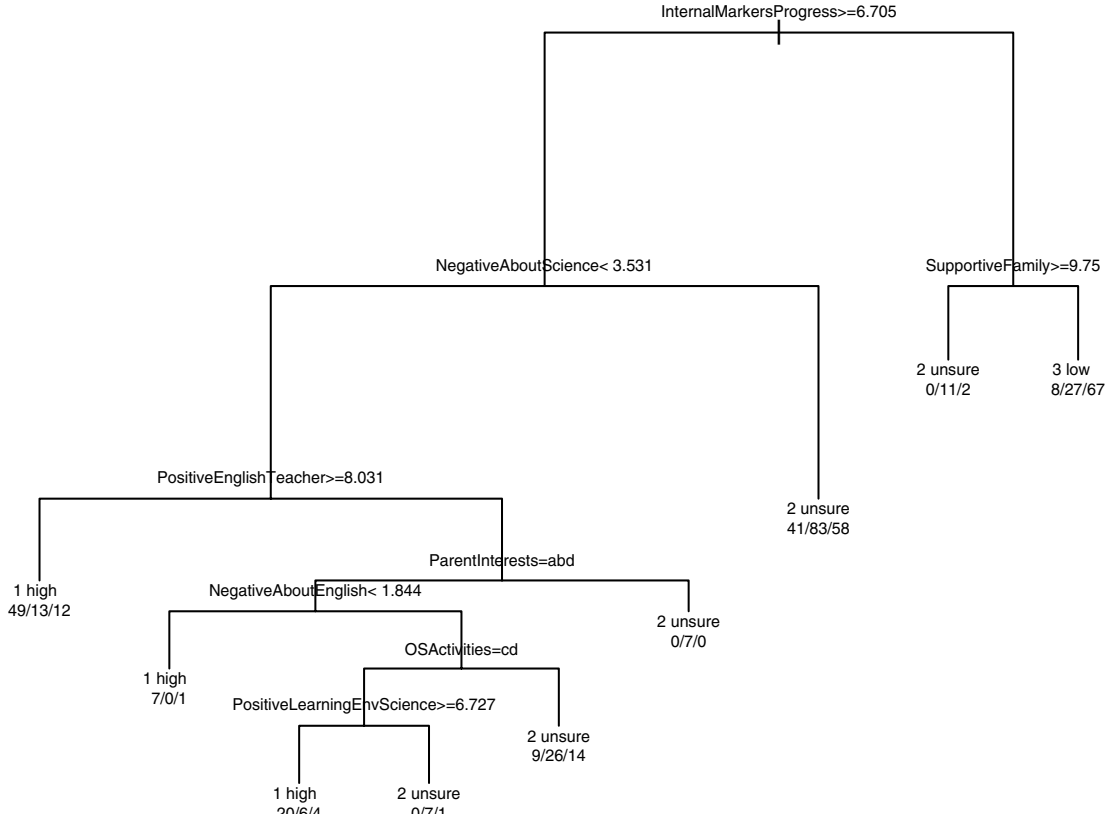
- Family communicates well
- Friends with risky behaviour
- Negative about all of English, Mathematics and Science
- Positive attitude to English teacher
- Positive attitude to Science teacher
- Positive learning environment in Science
- Risky behaviour
- Students' leisure activities
- Parent interests
- Subject choice cluster

The most important variables in the classification tree model were internal markers of achievement, and for those with high scores on this variable, negative about Science. A plot of the tree is shown in Figure 39. The variables used in the tree were internal markers of achievement, negative about Science, supportive family, positive attitude to English teacher, parental interests, negative about English, students' leisure activities, and positive learning environment in Science.

The branching is determined by the criteria written above the branches, and these criteria characterise the left branch. For example, at the first branch, a student would go to positive about science if their internal markers score was 6.705 or more, and to supportive family otherwise.

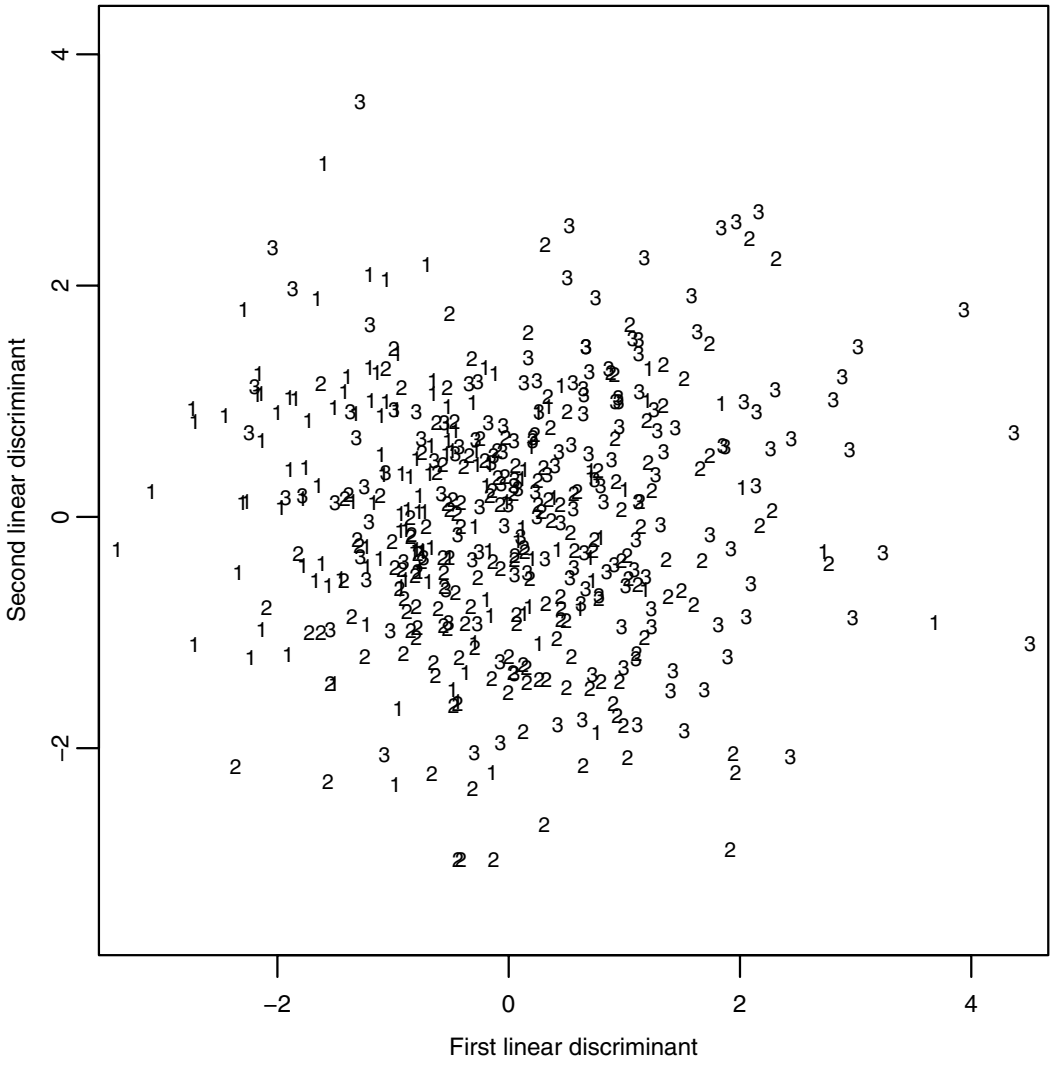
The numbers at the end of each branch represent the number of students classified as having high/unsure/low levels of motivation. The parent interests more likely to be associated with "high" motivation (a, b, d on the diagram) were TV/low involvement, Literate/involved, and TV/few interests (in other words, mixed interests were more likely to be associated with "unsure"). The students' leisure interests that were more likely to be associated with "high' motivation (c or d on the diagram) were reading/arts/sports and creative interests.

Figure 39 **Pruned tree for motivation**



A plot of the first two discriminant axes is shown in Figure 40. Points marked with 1, 2, or 3 refer to students with high, unsure, or low motivation, respectively.

Figure 40 **Motivation data on the first two discriminant axes**



The three groups of students are not well discriminated, as there is a lot of overlap in the centre of the plot (if the discrimination is good, the groups are clearly separate). However, most of those with high motivation are to the left of the plot; most of those unsure are towards the bottom, and most of those with low levels of motivation are to the right. Eighty-one percent of the between-group variance is on the fist discriminant axis, and 19 percent on the second.

What variables were most useful? One way to attempt to answer this is to list the coefficients of the linear discriminants in ascending order. Those with large negative loadings will contribute to *low* scores on the discriminant variable, and those with large positive loadings will contribute for *high* scores. The absolute value of the loading indicates the relative importance of the variables. The loadings of the cluster variables are on the whole larger than those of the scale variables. However, the *contribution* made by the scale variables can be larger. The cluster variables have a value of 0 if the student is not in a particular cluster, or 1 if they are in the cluster. This means that, for example, the largest contribution that can be made by a student having leisure interests that include reading, arts and sport is –0.98. The scale variables have values between 1 and 10, so that the largest contribution for solid friendships, for example, is 10 × (-0.22) = -2.2, and the smallest is -0.22.

The first discriminant (Table 113) separated those with low levels of motivation from those with high levels. This means that students who used their leisure for reading/arts/sports, came from moderate or comfortable family financial situations, had anchored values, were doing arts and Māori, had high scores on solid

friendships, dissatisfaction and positive attitude to English teacher were more likely to be classified in the high motivation group. Those who did Technology Economics Horticulture Supplementary literacy/English or Māori Technology Graphic Design Technology Supplementary literacy/English, had high scores for risky behaviour, challenging schoolwork, or being negative about their three compulsory subjects were more likely to be classified in the low motivation group.

Table 113 **Ordered list of variables with loadings of 0.13 or more in absolute value on the first linear discriminant**

Scale Variables	First linear discriminant	Cluster Variables	First linear discriminant
		Students' leisure: Reading/arts/sports	-0.98
		Financial Situation: Comfortable	-0.81
		Financial Situation: Moderate	-0.54
		Students' values: Anchored	-0.36
		Students' leisure: Sports player	-0.33
		Students' leisure:Creative interests	-0.29
		Students' subject choice: Arts Māori	-0.28
		Parent Interests: Literate/Involved	-0.26
		Parent Interests: TV/Few interests	-0.25
		Students' subject choice: Japanese GDT Other lang	-0.22
		Adverse events: 2 or more items	-0.21
Solid friendships	-0.22	Students' subject choice: Tech Arts IT SuppLit Other lang	-0.20
Dissatisfaction	-0.21	Parent Interests: Mixed Interests	-0.20
Positive attitude to English teacher	-0.15	Students' values: Anchored/achieving	-0.16
Negative about Mathematics	0.15	Students' subject choice: Māori Tech GDT SuppLit	0.35
Negative about English	0.17	Students' subject choice: Tech Econ Hort SuppLit	0.42
Negative about Science	0.18		
Challenging schoolwork	0.19		
Risky behaviour	0.21		

The second linear discriminant served mainly to distinguish between those who had either high or low motivation and those who were classified as unsure. Table 114 lists all the high and low loadings for the second linear discriminant.

Table 114 **Ordered list of variables with loadings of 0.13 or more in absolute value on the second linear discriminant**

Variables	Second linear discriminant	Cluster Variables	Second linear discriminant
Positive attitude to Science teacher	-0.36		
Positive learning environment in Mathematics	-0.18		
Friends with risky behaviour	-0.18		
Positive learning environment in English	-0.17	Students' subject choice: Māori Tech GDT SuppLit	-0.67
		Parental interests: Mixed Interests	-0.56
Inclusive family	-0.15	Financial Situation:Comfortable	-0.55
Solid friendships	-0.15	Students' values: Anchored	-0.51
Family pressure	-0.15	Students' values: Anchored/achieving	-0.27
Negative about Science	-0.15	Students' subject choice: Japanese GDT Other languages	-0.22
Disrupted learning environment	-0.14	Students' subject choice: Tech Arts IT SuppLit Other lang	0.19
Family communicates well	0.18	Financial Situation: Moderate	0.19
Challenging schoolwork	0.27	Students' subject choice: Tech Econ Hort SuppLit	0.28
Positive learning environment in Science	0.28	Parental interests: TV/Few interests	0.30
Parent-child friction	0.34	Students' subject choice: Arts Māori	0.33
Positive attitude to English teacher	0.40	Adverse events: 2 or more items	0.36
		Students' subject choice: French IT Econ TIM	0.55
		Parental interests:Literate/Involved	0.55
		Adverse events: One item	0.60

For the second linear discriminant, unsure motivation is more likely to be associated with high scores of variables with negative loadings, and high or low motivation with high scores of variables with positive loadings.

8. Results: Research question 9

Research question 9: What consistency is there between young adult, parent, and teacher reports of the teenagers' engagement in learning, attitudes to school, and overall performance?

To answer this question we took a set of our scale variables (see Section 2) and some individual interview items to investigate consistency:

Student

- Confident in school (student feels they are treated as an individual, feel they belong and are safe, etc.)
- Absorbed in learning (student gets totally absorbed in their work, checks their work, work out problems in group, works with understanding, etc.)
- Engaged in school (student likes teachers and enjoys learning, feels the rules are fair, etc.)
- Positive attitude to English, Mathematics, or Science teacher (student likes them, thinks they are fair and understand student feelings)
- Positive learning environment in English, Mathematics or Science (student feels the teacher gives clear instructions and expectations, is helpful, is interested in the students, etc)
- Disengaged in learning (student misbehaves in class, puts in minimal effort, etc.)
- Dissatisfaction (student feels left out, doesn't have enough freedom. is bored and irritable, doesn't have enough money, has conflicts with those around them, gets picked on)

Parent

- Parent view that student is self-confident (enjoys new experiences, asks a lot of questions, confident in interactions with adults, etc.)
- Parent view that student is effective (meets personal goals, is a good listener, willing to learn from mistakes, etc.)
- Parent view that student is responsible (takes responsibility for getting organised, passes on messages accurately, finishes all chores, etc.)
- Parent view of students' current feelings about school
- Parent view of students' feelings towards teachers (Likes current teachers?)
- Parent view of support from current teachers for students' learning
- Parent view of support from current teachers for students' emotional well-being
- Parent satisfaction with students' progress
- Parent view whether there is anything they would like to change at the school
- Parent having concerns about their student and the school

Teacher

- Attitudinal competency at age 14: the overall mean measure, and the eight separate measures for perseverance, self-management, self-efficacy, curiosity, social skills (with peers, adults, and both) and communication
- Teacher perception of student overall achievement relative to peers

Parent versus student reports

Parental report of student self-efficacy

There were weak to moderate correlations between *student self-efficacy (parental)* and eight of the student variables. Students who indicated that they are confident at school or engaged in school (they had a high score) tended to have a higher score in terms of parents' rating of their effectiveness, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of parents' rating of their effectiveness.

Table 115 **Correlations between student variables and parental reports of student self-efficacy**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.31	Disengaged in learning	0.26
Confident at school	0.24		
Absorbed in learning	0.19		
Positive learning environment in English	0.16		
Positive attitude to Science teacher	0.13		
Positive attitude to English teacher	0.12		
Positive learning environment in Science	0.12		

Parental report of student responsibility

There were weak correlations between *student responsibility (parental)* and 10 of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school or had a positive attitude to their Science teacher (they had a high score) tended to have a higher score in terms of parents' rating of their responsibility, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of parents' rating of their responsibility.

Table 116 **Correlations between student variables and parental reports of student responsibility**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.29		
Confident at school	0.25		
Absorbed in learning	0.25		
Positive attitude to Science teacher	0.22	Disengaged in learning	0.23
Positive learning environment in Science	0.19		
Positive learning environment in English	0.18		
Positive attitude to English teacher	0.15		
Positive attitude to Mathematics teacher	0.13		
Positive learning environment in Mathematics	0.13		

Parental report of student self-confidence

There was weak correlation between *student self-confidence (parental)* and seven of the student variables. Students who indicated that they are absorbed in learning (they had a high score) tended to have a higher score in terms of parents' rating of their self-confidence.

Table 117 **Correlations between student variables and parental reports of student self-confidence**

Student variables	Positive correlations
Absorbed in learning	0.22
Positive learning environment in English	0.18
Engaged in school	0.15
Confident at school	0.14
Positive attitude to Science teacher	0.14
Positive learning environment in Science	0.13
Positive learning environment in Science	0.13

Parental report of students' current feelings about school

There was weak to moderate correlation between *current feelings about school* and six of the student variables. Students who indicated that they are confident at school or engaged in school (they had a high score) tended to also have their current feelings about school rated more highly by their parents.

Table 118 **Correlations between student variables and parental reports of students' current feelings about school**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.35		
Confident at school	0.21		
Absorbed in learning	0.18		
Positive attitude to Mathematics teacher	0.13	Disengaged in learning	0.13
Positive learning environment in Mathematics	0.13		

Parental report of current feelings about teachers

There was weak correlation between *current feelings about teachers* and six of the student variables. Students who indicated that they are engaged in school (they had a high score) tended to have their current feelings about teachers given a higher rating by their parents.

Table 119 **Correlations between student variables and parental reports of students' current feelings about teachers**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.25		
Positive attitude to Mathematics teacher	0.19	Disengaged in learning	0.20
Positive learning environment in Mathematics	0.19		
Positive attitude to English teacher	0.17		
Absorbed in learning	0.15		

Parental perceptions of school support for learning

There was weak correlation between *support for learning* and 10 of the student variables. Students who indicated that they are engaged in school or have a positive attitude to their Mathematics teacher (they had a high score) tended to have a higher score in terms of parents' rating of their teachers support for learning.

Table 120 **Correlations between student variables and parental reports of support for learning**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.23		
Positive attitude to Mathematics teacher	0.20		
Positive learning environment in Mathematics	0.18	Disengaged in learning	0.19
Confident at school	0.17		
Absorbed in learning	0.17		
Positive attitude to Science teacher	0.17		
Positive attitude to English teacher	0.15		
Positive learning environment in English	0.15		
Positive learning environment in Science	0.15		

Parental perceptions of school support for emotional well-being

There was weak correlation between *support for emotional well-being* and four of the student variables.

Table 121 **Correlations between student variables and parental reports of support for emotional well-being**

Student variables	Positive correlations
Positive attitude to Mathematics teacher	0.17
Engaged in school	0.16
Positive learning environment in Mathematics	0.14
Absorbed in learning	0.13

Parent satisfaction with student progress

There was weak correlation between *satisfied with progress* and eight of the student variables. Students who indicated that they are absorbed in learning or engaged in school (they had a high score) tended to have a parents who were more satisfied with their progress.

Table 122 **Correlations between student variables and parental satisfaction with students' progress**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.25		
Absorbed in learning	0.21		
Positive attitude to Mathematics teacher	0.17	Disengaged in learning	0.17
Positive learning environment in Science	0.17		
Positive attitude to Science teacher	0.16		
Positive learning environment in Mathematics	0.15		
Confident at school	0.13		

Parent desire for change at school

There was a weak correlation between *anything the parent would like to change at school* and disengaged in learning (r = -0.17).

Parental concerns about student and school

There was weak correlation between *parent concerns about their student and school* and four of the student variables. Students who indicated that they are engaged in school (they had a high score) tended to have parents who had no concerns about their student and school, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have parents who expressed concerns.

Table 123 **Student variable correlations with concerns about their student and school parent report**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.29	Disengaged in learning	0.22
Absorbed in learning	0.18		
Confident at school	0.16		

Parent versus teacher reports

Parent report of student self-efficacy

There were weak correlations between *student effective* and all of the teacher variables.

Table 124 **Correlations between teacher variables and parental report of student self-efficacy**

Teacher variables	Positive correlations
Mean attitudinal competency	0.44
Social skills	0.43
Social skills (peers)	0.42
Self efficacy	0.41
Communication	0.41
Perseverance	0.40
Overall achievement	0.39
Social skills (adults)	0.38
Self management	0.37
Curiosity	0.34

Parent report of student responsibility

There were weak to moderate correlations between *student responsible* and all of the teacher variables.

Table 125 **Correlations between teacher variables and parental report of student responsibility**

Teacher variables	Positive correlations
Overall achievement	0.48
Mean attitudinal competency	0.47
Perseverance	0.46
Communication	0.46
Self management	0.42
Self efficacy	0.42
Social skills	0.42
Social skills (adults)	0.40
Social skills (peers)	0.39
Curiosity	0.37

Parent report of student self-confidence

There were weak correlations between *student self-confidence* and nine of the teacher variables.

Table 126 **Correlations between teacher variables and parental reports of student self-confidence**

Teacher variables	Positive correlations
Curiosity	0.28
Self efficacy	0.25
Mean attitudinal competency	0.23
Communication	0.22
Social skills	0.21
Social skills (adults)	0.20
Overall achievement	0.20
Social skills (peers)	0.19
Perseverance	0.17

Parent perceptions of students' current feelings about school

There were weak to moderate correlations between *current feelings about school* and all of the teacher variables.

Table 127 **Correlations between teacher variables and parental reports of students' current feelings about school**

Teacher variables	Positive correlations
Self efficacy	0.35
Mean attitudinal competency	0.34
Perseverance	0.31
Social skills (adults)	0.31
Social skills	0.31
Self management	0.30
Communication	0.29
Social skills (peers)	0.28
Overall achievement	0.28
Curiosity	0.26

Parental perceptions of students' current feelings about teachers

There were weak correlations between *current feelings about teachers* and all of the teacher variables.

Table 128 **Correlations between teacher variables and parental reports of students' current feelings about teachers**

Teacher variables	Positive correlations
Self management	0.23
Perseverance	0.22
Mean attitudinal competency	0.22
Social skills (adults)	0.21
Self efficacy	0.20
Social skills	0.19
Curiosity	0.18
Communication	0.18
Social skills (peers)	0.16
Overall achievement	0.12

Parental perceptions of school support for learning

There were weak correlations between *support for learning* and all of the teacher variables.

Table 129 **Correlations between teacher variables and parental reports of support provided for students' learning**

Teacher variables	Positive correlations
Social skills	0.32
Mean attitudinal competency	0.32
Self efficacy	0.31
Curiosity	0.31
Social skills (peers)	0.30
Perseverance	0.28
Social skills (adults)	0.28
Communication	0.28
Overall achievement	0.24
Self management	0.22

Parental perceptions of school support for emotional well-being

There were weak correlations between *support for emotional well-being* and nine of the teacher variables.

Table 130 **Correlations between teacher variables and parental reports of support for students' emotional well-being**

Teacher variables	Positive correlations
Social skills	0.20
Mean attitudinal competency	0.20
Curiosity	0.19
Social skills (peers)	0.19
Self efficacy	0.18
Social skills (adults)	0.18
Perseverance	0.17
Self management	0.16
Communication	0.15

Parent satisfaction with student progress

There were weak to moderate correlations between *satisfied with progress* and all of the teacher variables.

Table 131 **Correlations between teacher variables and parent satisfaction with students' progress**

Teacher variables	Positive correlations
Perseverance	0.41
Mean attitudinal competency	0.41
Self efficacy	0.39
Self management	0.38
Social skills	0.38
Communication	0.38
Social skills (peers)	0.37
Overall achievement	0.37
Social skills (adults)	0.32
Curiosity	0.29

Parent desire for change at school

There was no correlation between *anything you would like to change at school* and any of the teacher variables.

Parental concerns about student and school

There were weak to moderate correlations between *concerns about their student and school* and all of the teacher variables. Teachers who indicated students' perseverance, self management, self efficacy, curiosity, social skills, communication, mean attitudinal competency or overall achievement was good tended to be associated with parents who had *no* concerns about their student and school.

Table 132 **Correlations between teacher variables and parental reports about concerns about the students (at school)**

Teacher variables	Positive correlations
Social skills (peers)	0.43
Social skills	0.41
Mean attitudinal competency	0.41
Self efficacy	0.40
Perseverance	0.39
Self management	0.37
Communication	0.35
Overall achievement	0.35
Social skills (adults)	0.31
Curiosity	0.29

Teacher versus student reports

Perseverance at age 14

There were weak to moderate correlations between *perseverance* and 10 of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, or have a positive learning environment in English or Science (they had a high score) tended to have a higher score in terms of teachers' rating of their perseverance, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their perseverance.

Table 133 **Correlations between student variables and perseverance (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.53		
Confident at school	0.36	Disengaged in learning	0.42
Absorbed in learning	0.35		
Positive attitude to English teacher	0.27		
Positive attitude to Science teacher	0.26		
Positive learning environment in English	0.25		
Positive learning environment in Science	0.22		
Positive attitude to Mathematics teacher	0.20		
Positive learning environment in Mathematics	0.16		

Self-management at age 14

There were weak to moderate correlations between *self-management* and 10 of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, or have a positive learning environment in English or Science (they had a high score) tended to have a higher score in terms of teachers' rating of their self management, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their self management.

Table 134 **Correlations between student variables and self-management (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.51	Disengaged in learning	0.41
Confident at school	0.33		
Absorbed in learning	0.32		
Positive attitude to English teacher	0.24		
Positive attitude to Science teacher	0.23		
Positive learning environment in English	0.21		
Positive learning environment in Science	0.20		
Positive attitude to Mathematics teacher	0.17		
Positive learning environment in Mathematics	0.12		

Self-efficacy at age 14

There were weak to moderate correlations between *self-efficacy* and 10 of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, or have a positive learning environment in English or Science (they had a high score) tended to have a higher score in terms of teachers' rating of their self efficacy, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their self efficacy.

Table 135 **Correlations between student variables and self-efficacy (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.51		
Confident at school	0.40		
Absorbed in learning	0.38	Disengaged in learning	0.38
Positive attitude to English teacher	0.30		
Positive learning environment in English	0.30		
Positive attitude to Science teacher	0.27		
Positive learning environment in Science	0.23		
Positive attitude to Mathematics teacher	0.22		
Positive learning environment in Mathematics	0.19		

Curiosity at age 14

There were weak to moderate correlations between *curiosity* and 10 of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, or have a positive learning environment in English or Science (they had a high score) tended to have a higher score in terms of teachers' rating of their curiosity, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their curiosity.

Table 136 **Correlations between student variables and curiosity (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.42		
Confident at school	0.34		
Absorbed in learning	0.30	Disengaged in learning	0.29
Positive learning environment in English	0.26		
Positive attitude to English teacher	0.24		
Positive attitude to Science teacher	0.23		
Positive learning environment in Science	0.20		
Positive attitude to Mathematics teacher	0.16		
Positive learning environment in Mathematics	0.15		

Social skills (peers) at age 14

There were weak to moderate correlations between *social skills (peers)* and nine of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, or have a positive learning environment in English (they had a high score) tended to have a higher score in terms of teachers' rating of their social skills in relation to peers, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their social skills in relation to peers.

Table 137 **Correlations between student variables and social skills with peers (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.47		
Confident at school	0.36	Disengaged in learning	0.38
Absorbed in learning	0.34		
Positive attitude to English teacher	0.22		
Positive learning environment in English	0.22		
Positive attitude to Science teacher	0.21		
Positive attitude to Mathematics teacher	0.17		
Positive learning environment in Science	0.17		
Positive learning environment in Mathematics	0.13		

Social skills (adults) at age 14

There were weak to moderate correlations between *social skills (adults)* and 10 of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, or have a positive learning environment in English or Science (they had a high score) tended to have a higher score in terms of teachers' rating of their social skills in relation to adults, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their social skills in relation to adults.

Table 138 **Correlations between student variables and social skills with adults (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.47		
Confident at school	0.38	Disengaged in learning	0.35
Absorbed in learning	0.33		
Positive attitude to Science teacher	0.28		
Positive attitude to English teacher	0.27		
Positive learning environment in English	0.25		
Positive learning environment in Science	0.24		
Positive attitude to Mathematics teacher	0.22		
Positive learning environment in Mathematics	0.19		

Social skills at age 14

There were weak to moderate correlations between *social skills* and 10 of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, or have a positive learning environment in English or Science (they had a high score) tended to have a higher score in terms of teachers' rating of their social skills, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their social skills.

Table 139 **Correlations between student variables and social skills (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.50		
Confident at school	0.39	Disengaged in learning	0.39
Absorbed in learning	0.36		
Positive attitude to English teacher	0.26		
Positive attitude to Science teacher	0.25		
Positive learning environment in English	0.25		
Positive learning environment in Science	0.21		
Positive attitude to Mathematics teacher	0.20		
Positive learning environment in Mathematics	0.16		

Communication at age 14

There were weak to moderate correlations between *communication* and nine of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, or have a positive learning environment in English or Science (they had a high score) tended to have a higher score in terms of teachers' rating of their communication skills, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their communication skills.

Table 140 **Correlations between student variables and communication (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.49		
Confident at school	0.36	Disengaged in learning	0.41
Absorbed in learning	0.31		
Positive attitude to English teacher	0.25		
Positive attitude to Science teacher	0.24		
Positive learning environment in English	0.22		
Positive learning environment in Science	0.20		
Positive attitude to Mathematics teacher	0.15		

Mean composite attitudinal competency at age 14

There were weak to moderate correlations between *attitudinal competency* and 10 of the student variables. Students who indicated that they are confident at school, absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, or have a positive learning environment in English or Science (they had a high score) tended to have a higher score in terms of teachers' rating of their attitudinal competency, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their attitudinal competency.

Table 141 **Correlations between student variables and mean attitudinal composite competency (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.55		
Confident at school	0.41	Disengaged in learning	0.43
Absorbed in learning	0.37		
Positive attitude to English teacher	0.29		
Positive attitude to Science teacher	0.28		
Positive learning environment in English	0.27		
Positive learning environment in Science	0.24		
Positive attitude to Mathematics teacher	0.20		
Positive learning environment in Mathematics	0.17		

Overall achievement

There were weak to moderate correlations between *overall achievement* and eight of the student variables. Students who indicated that they are confident at school, absorbed in learning or engaged in school (they had a high score) tended to have a higher score in terms of teachers' rating of their overall achievement, and students who reported being disengaged in learning (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their overall achievement.

Table 142 **Correlations between student variables and overall achievement (teacher report)**

Student variables	Positive correlations	Student variables	Negative correlations
Engaged in school	0.44		
Confident at school	0.33	Disengaged in learning	0.32
Absorbed in learning	0.27		
Positive attitude to Science teacher	0.19		
Positive attitude to English teacher	0.17		
Positive learning environment in English	0.15		
Positive learning environment in Science	0.14		

9. Results: Research question 10

Research question 10: What consistency is there between competency levels at age 14 and young adults' judgements of their school experiences, parental satisfaction with their child's school, whether the school was the first choice of parents and young adult, and teacher perceptions of the young adult's school engagement, and the parental support for their learning?

To answer this question we took a set of our factor scale variables (see Section 2), some cluster variables, and some individual interview items to investigate consistency:

- Absorbed in learning (student gets totally absorbed in their work, checks their work, work out problems in group, works with understanding, etc.)
- Engaged in school (student likes teachers and enjoys learning, feels the rules are fair, etc.)
- Positive attitude to English, Mathematics, or Science teacher (student likes them, thinks they are fair and understand student feelings)
- Positive learning environment in English, Mathematics or Science (student feels the teacher gives clear instructions and expectations, is helpful, is interested in the students, etc)
- Disengaged in learning (student misbehaves in class, puts in minimal effort, etc.)
- Dissatisfaction (student feels left out, doesn't have enough freedom. is bored and irritable, doesn't have enough money, has conflicts with those around them, gets picked on)
- Negative about English, Mathematics and Science (student plans to drop the subject, doesn't know how to do the work, and does not do well)
- Parent view of whether school is first choice
- Parent view of students' current feelings about school
- Parent view of support from current teachers for students' learning
- Parent view of support from current teachers for students' emotional well-being
- Parent view of whether they feel welcome in school
- Parent satisfaction with students' progress
- Parent view whether there is anything they would like to change at the school
- Parents having concerns about their student and the school
- Student view of whether school is first choice
- Parental support for schoolwork
- Teacher related hindrances
- Student related hindrances

Competencies

- Attitudinal competency at age 14: the overall mean measure, and the eight separate measures for perseverance, self-management, self-efficacy, curiosity, social skills (with peers, adults, and both) and communication
- Cognitive competency at age 14: the overall mean measure, and the three separate measures for reading comprehension, mathematics and logical problem-solving
- Teacher perception of student overall achievement relative to peers

Perseverance at age 14

There were weak to moderate correlations between *perseverance* and 15 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, have a positive learning environment in English or Science, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of teachers' rating of their perseverance, and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their perseverance.

Table 143 **Correlations between perseverance and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.53	Disengaged in learning	0.42
		Negative about Mathematics	0.41
		Negative about English	0.37
Absorbed in learning	0.35	Negative about Science	0.37
Current feelings about school	0.31		
Support for students' learning	0.29		
Positive attitude to English teacher	0.27		
Positive attitude to Science teacher	0.26		
Positive learning environment in English	0.25		
Positive learning environment in Science	0.22		
Positive attitude to Mathematics teacher	0.20		
Support for students' well-being	0.18		
Positive learning environment in Mathematics	0.16		

Self-management at age 14

There were weak to moderate correlations between *self management* and 15 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, have a positive learning environment in English, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of teachers' rating of their self management, and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their self management.

Table 144 **Correlations between self management and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.51	Disengaged in learning	0.41
Absorbed in learning	0.32	Negative about Mathematics	0.35
Current feelings about school	0.31	Negative about English	0.33
Positive attitude to English teacher	0.24	Negative about Science	0.33
Support for students' learning	0.24		
Positive attitude to Science teacher	0.23		
Positive learning environment in English	0.21		
Positive learning environment in Science	0.20		
Support for students' well-being	0.18		
Positive attitude to Mathematics teacher	0.17		
Positive learning environment in Mathematics	0.12		

Self-efficacy at age 14

There were weak to moderate correlations between *self efficacy* and 15 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, have a positive learning environment in English or Science, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of teachers' rating of their self efficacy, and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their self efficacy.

Table 145 **Correlations between self efficacy and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.51		
Absorbed in learning	0.38	Disengaged in learning	0.38
Current feelings about school	0.35	Negative about Science	0.36
Support for students' learning	0.31	Negative about English	0.35
Positive learning environment in English	0.30	Negative about Mathematics	0.34
Positive attitude to English teacher	0.30		
Positive attitude to Science teacher	0.27		
Positive learning environment in Science	0.23		
Positive attitude to Mathematics teacher	0.22		
Support for students' well-being	0.19		
Positive learning environment in Mathematics	0.19		

Curiosity at age 14

There were weak to moderate correlations between *curiosity* and 15 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, have a positive learning environment in English or Science, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of teachers' rating of their curiosity, and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their curiosity.

Table 146 **Correlations between curiosity and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.42	Negative about Mathematics	0.36
Support for students' learning	0.31	Negative about Science	0.34
Absorbed in learning	0.30	Disengaged in learning	0.29
Positive learning environment in English	0.26	Negative about English	0.29
Current feelings about school	0.26		
Positive attitude to English teacher	0.24		
Positive attitude to Science teacher	0.23		
Positive learning environment in Science	0.20		
Support for students' well-being	0.19		
Positive attitude to Mathematics teacher	0.16		
Positive learning environment in Mathematics	0.15		

Social skills (peers) at age 14

There were weak to moderate correlations between *social skills (peers)* and 15 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, have a positive learning environment in English, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning and well-being (they had a high score) tended to have a higher score in terms of teachers' rating of their social skills (peers), and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their social skills (peers).

Table 147 **Correlations between social skills with peers and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.47	Disengaged in learning	0.38
Absorbed in learning	0.34	Negative about Mathematics	0.31
Support for students' learning	0.32	Negative about Science	0.31
Current feelings about school	0.29	Negative about English	0.30
Positive attitude to English teacher	0.22		
Positive learning environment in English	0.22		
Positive attitude to Science teacher	0.21		
Support for students' well-being	0.21		
Positive attitude to Mathematics teacher	0.17		
Positive learning environment in Science	0.17		
Positive learning environment in Mathematics	0.13		

Social skills (adults) at age 14

There were weak to moderate correlations between *social skills (adults)* and 15 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, have a positive learning environment in English or Science, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of teachers' rating of their social skills (adults), and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their social skills (adults).

Table 148 **Correlations between social skills with adults and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.47	Negative about Science	0.36
Absorbed in learning	0.33	Disengaged in learning	0.35
Current feelings about school	0.31	Negative about Mathematics	0.31
Support for students' learning	0.29	Negative about English	0.29
Positive attitude to Science teacher	0.28		
Positive attitude to English teacher	0.27		
Positive learning environment in English	0.25		
Positive learning environment in Science	0.24		
Positive attitude to Mathematics teacher	0.22		
Support for students' well-being	0.20		
Positive learning environment in Mathematics	0.19		

Social skills at age 14

There were weak to moderate correlations between *social skills* and 15 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, have a positive learning environment in English or Science, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning and well-being (they had a high score) tended to have a higher score in terms of teachers' rating of their social skills, and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their social skills.

Table 149 **Correlations between social skills and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.50	Disengaged in learning	0.39
Absorbed in learning	0.36	Negative about Science	0.35
Support for students' learning	0.33	Negative about Mathematics	0.33
Current feelings about school	0.31	Negative about English	0.31
Positive attitude to English teacher	0.26		
Positive attitude to Science teacher	0.25		
Positive learning environment in English	0.25		
Support for students' well-being	0.22		
Positive learning environment in Science	0.21		
Positive attitude to Mathematics teacher	0.20		
Positive learning environment in Mathematics	0.16		

Communication at age 14

There were weak to moderate correlations between *communication* and 14 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English or Science teacher, have a positive learning environment in English or Science, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of teachers' rating of their communication, and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their communication.

Table 150 **Correlations between communication and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.49	Disengaged in learning	0.41
		Negative about Mathematics	0.39
		Negative about Science	0.38
Absorbed in learning	0.31	Negative about English	0.34
Current feelings about school	0.30		
Support for students' learning	0.29		
Positive attitude to English teacher	0.25		
Positive attitude to Science teacher	0.24		
Positive learning environment in English	0.22		
Positive learning environment in Science	0.20		
Support for students' well-being	0.16		
Positive attitude to Mathematics teacher	0.15		

Mean composite attitudinal competency at age 14

There were weak to moderate correlations between *mean attitudinal competency* and 15 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, have a positive attitude to their English, Mathematics or Science teacher, have a positive learning environment in English or Science, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning and well-being (they had a high score) tended to have a higher score in terms of teachers' rating of their attitudinal competency, and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their attitudinal competency.

Table 151 **Correlations between mean attitudinal competency and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.55	Disengaged in learning	0.43
Absorbed in learning	0.37	Negative about Mathematics	0.40
Current feelings about school	0.34	Negative about Science	0.39
Support for students' learning	0.33	Negative about English	0.37
Positive attitude to English teacher	0.29		
Positive attitude to Science teacher	0.28		
Positive learning environment in English	0.27		
Positive learning environment in Science	0.24		
Support for students' well-being	0.21		
Positive attitude to Mathematics teacher	0.20		
Positive learning environment in Mathematics	0.17		

Mathematics at age 14

There were weak to moderate correlations between *Mathematics* and nine of the other variables. Students who indicated that they are engaged in school, or parents who indicated that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of competency in Mathematics, and students who reported being disengaged in learning, or negative towards Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of competency in Mathematics.

Table 152 **Correlations between mathematics and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
		Negative about Mathematics	0.40
Engaged in school	0.28	Negative about Science	0.28
Support for students' learning	0.25	Disengaged in learning	0.22
Current feelings about school	0.20	Negative about English	0.16
		Student hindrance	0.15
Absorbed in learning	0.13		

Logical problem solving at age 14

There were weak correlations between *logical problem solving* and eight of the other variables. Students who indicated that they are engaged in school (they had a high score) tended to have a higher score in terms of competency in logical problem solving, and students who reported being disengaged in learning, or negative towards Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of competency in logical problem solving.

Table 153 **Correlations between logical problem solving and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.29	Negative about Mathematics	0.32
Support for students' learning	0.20	Disengaged in learning	0.23
Dissatisfaction	0.14	Negative about Science	0.22
Current feelings about school	0.14	Student hindrance	0.15

PAT reading comprehension at age 14

There were weak correlations between *reading comprehension* and 10 of the other variables. Students who indicated that they are engaged in school, or parents who indicated that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of competency in reading comprehension, and students who reported being disengaged in learning, or negative towards Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of competency in reading comprehension.

Table 154 **Correlations between reading comprehension and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.32	Negative about Science	0.30
Support for students' learning	0.24	Negative about Mathematics	0.29
Absorbed in learning	0.16	Disengaged in learning	0.23
Current feelings about school	0.13	Negative about English	0.19
Positive attitude to Science teacher	0.12	Student hindrance	0.14

Mean composite cognitive competency at age 14

There were weak to moderate correlations between *mean cognitive competency* and 10 of the other variables. Students who indicated that they are engaged in school, or parents who indicated that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of competency in cognitive competency, and students who reported being disengaged in learning, or negative towards Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of competency in cognitive competency.

Table 155 **Correlations between mean cognitive competency and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.33	Negative about Mathematics	0.36
Support for students' learning	0.27	Negative about Science	0.31
Absorbed in learning	0.17	Disengaged in learning	0.27
Current feelings about school	0.17	Negative about English	0.20
Positive attitude to Science teacher	0.13	Student hindrance	0.19

Overall achievement

There were weak to moderate correlations between *overall achievement* and 12 of the other variables. Students who indicated that they are absorbed in learning, engaged in school, or parents who indicated their student's enjoyment of school (current feelings), or that teachers supported the students' learning (they had a high score) tended to have a higher score in terms of teachers' rating of their overall achievement, and students who reported being disengaged in learning, or negative towards English, Mathematics and Science (they had a high score, but negative correlation) tended to have a lower score in terms of teachers' rating of their overall achievement.

Table 156 **Correlations between overall achievement and engagement scale variables**

Variables	Positive correlations	Variables	Negative correlations
Engaged in school	0.44	Negative about Mathematics	0.45
Current feelings about school	0.28	Negative about Science	0.39
Absorbed in learning	0.27	Negative about English	0.33
Support for students' learning	0.24	Disengaged in learning	0.32
Positive attitude to Science teacher	0.19		
Positive attitude to English teacher	0.17		
Positive learning environment in English	0.15		
Positive learning environment in Science	0.14		

School is first choice: parent

There are associations between *school is first choice (parent)* and two of the student competencies (the *p*-values are in bold in Table 157). Self efficacy and Mathematics have significantly higher mean scores for students whose parents said their school was their first choice.

Table 157 **Group means student competencies (percentages) by school is first choice (parent) and ANOVA results**

Competencies	Yes	No	*p*-value[a]	Effect size[b] (%)	R^2 (%)[c]
Perseverance	67	61	0.074	1	10
Self management	75	70	0.076	1	6
Self efficacy	66	60	**0.046**	1	11
Curiosity	58	52	0.078	1	13
Social skills (peers)	73	72	0.779	< 1	6
Social skills (adults)	77	74	0.413	< 1	6
Social skills	74	73	0.632	< 1	7
Communication	64	62	0.284	< 1	11
Mean attitudinal competency	68	65	0.108	1	11
Mathematics	68	60	**0.011**	1	21
Logical problem solving	78	76	0.496	< 1	11
Reading comprehension	55	54	0.633	< 1	21
Mean cognitive competency	66	63	0.175	< 1	23
Overall achievement	68	63	0.386	< 1	17

[a] Probability from *F*-test of model including school first choice, and one without it.

[b] Partial eta-squared (η_p^2) for school first choice: see Section 3 (Method), page 32.

[c] Proportion of variability accounted for by model including maternal qualifications, family income and decile.

School is first choice: student

There are associations between *school is first choice (student)* and all of the student competencies except curiosity. Perseverance, self management, self efficacy, social skills, communication, attitudinal competency, cognitive competencies and overall achievement have significantly higher mean scores for students who said their school was their first choice than those who said it was not.

Table 158 **Group means student competencies (percentages) by school is first choice (student) and ANOVA results**

Competencies	Yes	Not sure	No	*p*-value[a]	Effect size[b] (%)	R^2 (%)[c]
Perseverance	68	68	61	**0.025**	2	11
Self management	76	75	70	**0.012**	2	8
Self efficacy	66	64	61	**0.036**	2	12
Curiosity	58	56	53	0.138	1	12
Social skills (peers)	74	72	71	**0.030**	2	8
Social skills (adults)	77	77	73	**0.017**	2	8
Social skills	75	73	71	**0.017**	2	9
Communication	65	65	60	**0.006**	2	13
Mean attitudinal competency	69	68	64	**0.011**	2	13
Mathematics	70	71	58	**<0.0001**	5	24
Logical problem solving	78	78	75	**0.001**	3	14
Reading comprehension	57	58	48	**<0.0001**	4	24
Mean cognitive competency	67	67	60	**<0.0001**	6	27
Overall achievement	69	71	61	**0.001**	3	19

[a] Probability from *F*-test of model including school first choice, and one without it.

[b] Partial eta-squared (η_p^2) for school first choice: see Section 3 (Method), page 32.

[c] Proportion of variability accounted for by model including maternal qualifications, family income and decile.

Parents feel welcome in the school

There are associations between *parents feel welcome in the school* and nine of the student competencies (p-values are bold in Table 159). Perseverance, self efficacy, curiosity, social skills, communication, attitudinal competency and logical problem solving have significantly higher mean scores for students whose parents said they feel welcome in the school than students whose parents said they did not.

Table 159 **Group means student competencies (percentages) by parents feel welcome in the school and ANOVA results**

Competencies	Yes	Varies	No	*p*-value[a]	Effect size[b] (%)	R^2 (%)[c]
Perseverance	67	62	59	**0.018**	2	11
Self management	75	71	69	0.075	1	7
Self efficacy	66	60	57	**0.0004**	4	14
Curiosity	58	51	50	**0.003**	3	14
Social skills (peers)	74	69	69	**0.006**	2	9
Social skills (adults)	77	72	71	**0.003**	2	8
Social skills	75	70	70	**0.003**	3	9
Communication	65	61	59	**0.009**	2	13
Mean attitudinal competency	69	64	62	**0.002**	3	13
Mathematics	68	70	60	0.130	1	20
Logical problem solving	78	80	73	**0.006**	2	14
Reading comprehension	56	56	49	0.262	1	21
Mean cognitive competency	66	67	61	0.071	1	23
Overall achievement	68	66	62	0.145	1	17

[a] Probability from *F*-test of model including school first choice, and one without it.

[b] Partial eta-squared (η_p^2) for school first choice: see Section 3 (Method), page 32.

[c] Proportion of variability accounted for by model including maternal qualifications, family income and decile.

Parental support for schoolwork

There are associations between *parental support for schoolwork* as rated by the school and four of the student competencies (*p*-values are bold in Table 160).

Table 160 **Group means student competencies (percentages) by school rating of parental support for schoolwork and ANOVA results**

Competencies	High	Medium	Low	*p*-value[a]	Effect size[b] (%)	R^2 (%)[c]
Perseverance	68	64	62	0.720	< 1	8
Self management	75	73	72	0.830	< 1	5
Self efficacy	67	63	61	0.396	< 1	8
Curiosity	58	56	53	0.997	< 1	8
Social skills (peers)	74	72	68	0.328	< 1	5
Social skills (adults)	77	76	72	0.507	< 1	5
Social skills	75	74	70	0.404	< 1	6
Communication	65	63	59	0.892	< 1	10
Mean attitudinal competency	69	67	64	0.808	< 1	9
Mathematics	71	64	53	**0.050**	1	21
Logical problem solving	79	76	71	**0.044**	1	13
Reading comprehension	59	51	42	**0.014**	2	22
Mean cognitive competency	69	63	56	**0.005**	2	24
Overall achievement	70	65	65	0.433	< 1	17

[a] Probability from *F*-test of model including school first choice, and one without it.
[b] Partial eta-squared (η_p^2) for school first choice: see Section 3 (Method), page 32.
[c] Proportion of variability accounted for by model including maternal qualifications, family income and decile.

Parental satisfaction with students' progress

There are associations between parents being *satisfied with progress* of their students and all of the student competencies.

Table 161 **Group means student competencies (percentages) by parental satisfaction with students' progress and ANOVA results**

Competencies	No	Qualified Yes	Yes	*p*-value[a]	Effect size[b] (%)	R^2 (%)[c]
		61	72	**<0.0001**	16	23
Self management	60	71	78	**<0.0001**	13	18
Self efficacy	52	60	69	**<0.0001**	15	23
Curiosity	48	51	61	**<0.0001**	9	19
Social skills (peers)	62	71	76	**<0.0001**	13	19
Social skills (adults)	66	74	79	**<0.0001**	10	15
Social skills	63	72	77	**<0.0001**	14	19
Communication	51	60	68	**<0.0001**	15	23
Mean attitudinal competency	55	64	72	**<0.0001**	16	25
Mathematics	54	64	71	**<0.0001**	6	24
Logical problem solving	72	77	79	**<0.0001**	5	16
Reading comprehension	44	51	59	**<0.0001**	5	25
Mean cognitive competency	57	63	69	**<0.0001**	8	28
Overall achievement	51	62	74	**<0.0001**	15	28

[a] Probability from *F*-test of model including school first choice, and one without it.
[b] Partial eta-squared (η_p^2) for school first choice: see Section 3 (Method), page 32.
[c] Proportion of variability accounted for by model including maternal qualifications, family income and decile.

Parent desire for change at school

There are associations between *anything you would like to change at school* and nine of the student competencies (bold in Table 162). Perseverance, self management, self efficacy, social skills, communication, attitudinal competency, Mathematics and reading comprehension have significantly higher mean scores for students whose parents did not want to change anything at their student's school.

Table 162 **Group means student competencies (percentages) by whether parents would like to change anything about the school and ANOVA results**

Competencies	No	Yes	*p*-value[a]	Effect size[b] (%)	R^2 (%)[c]
Perseverance	68	65	**0.011**	2	11
Self management	76	73	**0.003**	2	8
Self efficacy	66	64	**0.048**	1	11
Curiosity	57	56	0.194	< 1	12
Social skills (peers)	75	72	**0.003**	2	9
Social skills (adults)	77	76	0.229	< 1	6
Social skills	75	73	**0.013**	1	9
Communication	66	63	**0.016**	1	13
Mean attitudinal competency	69	67	**0.014**	1	12
Mathematics	69	66	**0.018**	1	21
Logical problem solving	78	77	0.474	< 1	12
Reading comprehension	56	54	**0.043**	1	21
Mean cognitive competency	67	65	**0.070**	1	23
Overall achievement	68	67	0.108	1	17

[a] Probability from *F*-test of model including school first choice, and one without it.
[b] Partial eta-squared (η_p^2) for school first choice: see Section 3 (Method), page 32.
[c] Proportion of variability accounted for by model including maternal qualifications, family income and decile.

Parental concerns about student and school

There are associations between *parents having concerns about their student and school* and all of the student competencies.

Table 163 **Group means student competencies (percentages) by parents having concerns about the student and school and ANOVA results**

Competencies	No	Qualified Yes	Yes	*p*-value[a]	Effect size[b] (%)	R^2 (%)[c]
Perseverance	71	63	49	**<0.0001**	15	23
Self management	78	73	60	**<0.0001**	13	18
Self efficacy	68	64	51	**<0.0001**	16	24
Curiosity	60	54	46	**<0.0001**	9	19
Social skills (peers)	76	72	62	**<0.0001**	16	22
Social skills (adults)	79	76	66	**<0.0001**	10	15
Social skills	77	73	63	**<0.0001**	16	22
Communication	67	62	51	**<0.0001**	13	22
Mean attitudinal competency	71	66	55	**<0.0001**	16	25
Mathematics	71	65	51	**<0.0001**	8	26
Logical problem solving	79	76	71	**<0.0001**	6	17
Reading comprehension	58	54	41	**<0.0001**	5	25
Mean cognitive competency	68	64	55	**<0.0001**	8	29
Overall achievement	72	64	51	**<0.0001**	11	26

[a] Probability from *F*-test of model including school first choice, and one without it.
[b] Partial eta-squared (η_p^2) for school first choice: see Section 3 (Method), page 32.
[c] Proportion of variability accounted for by model including maternal qualifications, family income and decile.

10. Results: Research question 11

Research question 11: Do different population sub-groups and different levels of competency at age 12 show different patterns of decision-making about secondary school choice, success in gaining access to the secondary school which was their first choice, satisfaction with the secondary school their child is in, and satisfaction with their child's transition to the school and their school progress? Is satisfaction with the secondary school dependent on its being the first choice of the family?

To answer this research question, discrete variables were cross-tabulated and chi-square tests applied: the variables used were the student responses about school choice (whether their secondary school was their first choice or not); an indicator variable as to whether their secondary school was the one indicated as their choice at age 12; student characteristics (gender, ethnicity, maternal qualifications, family income); school characteristics for their age 12 and age 14 schools (decile; gender mix, whether single-sex male or female or co-ed; authority, whether state or private; and size); and the history and cluster variables.

For the age-14 continuous scale variable scores (disengaged in learning, engaged in school, disrupted learning environment, etc), one-way ANOVAs were carried out on each score, using whether the school was first choice as explanatory variable. Similar models were fitted for the age 12 cognitive competency scores.

For the engaged in learning scale variable scores (engaged in school, disengaged in learning, absorbed in learning, and confident at school), we fitted more comprehensive models, with possible explanatory variables (reference group shown in italics where relevant):

- whether the school was the student's first choice (levels: yes, uncertain, *no*)
- whether the student would go to the school again, with the wisdom of hind-sight (levels: yes, not sure, *no*)
- whether the student was involved in the choice of the school (alone or with friend/s or with parent/s; levels: *yes*, no)
- decile of the school
- maternal qualifications
- family income at age 14
- overall achievement/cognitive competency score(s).

For these four scale variable scores we have fitted models under Research question 7 which included earlier competencies, and under Research question 8, which included current attitudes to school and some history and cluster factors. So after fitting the models to answer the current research question, we fitted a series of models that included all the independent variables that had been significant in the models for research questions 7, 8 and 11.

The methodology used to fit models is described more fully in Section 3, page 23.

One-way models that were significant

Those of the models that were significant are shown in Table 164. These models did not include maternal qualifications or family income.

Table 164 **Group means for competencies and scale variables (on 1–10 scale) and results of one-way ANOVA models about choice of secondary school**

Outcome variables	School first choice? Yes (*n* = 336)	Not certain (*n* = 33)	No (*n* = 105)	*p*-value	R^2 (%)
Absorbed in learning	6.9	6.8	6.4	0.0008	3.0
Parental view of students' self-efficacy	7.1	7.3	6.6	0.0003	3.4
Parental view of students' responsibility	7.5	7.4	7.1	0.0058	2.2
Parental view of students' self-confidence	7.6	7.8	7.3	0.0343	1.4
Close parent-child communication	8.1	8.1	7.7	0.0287	1.5
Confident at school	7.8	7.8	7.3	0.0018	2.6
Disrupted learning environment	5.7	5.6	6.2	0.0318	1.5
Dissatisfaction	3.6	3.5	4.1	0.0033	2.4
Engaged in school	7.3	7.7	6.6	< 0.0001	4.6
External markers of achievement	5.2	5.6	4.7	0.0093	2.0
Family pressure	3.4	3.5	4.0	0.0046	2.3
Friends with risky behaviour	3.5	2.8	4.2	0.0002	3.6
Good/organised	3.0	2.8	2.4	0.0083	2.0
Internal markers of achievement	7.6	7.6	7.2	0.0157	1.7
Negative about Mathematics	3.8	3.5	4.4	0.0005	3.2
Negative about Science	4.0	3.8	4.6	0.0201	1.6
Overall achievement at 14	6.9	7.1	6.1	0.0020	2.6
Parent-child friction	2.5	2.7	3.1	0.0005	3.2
Positive attitude to mathematics teacher	6.8	6.6	6.2	0.0305	1.5
Positive learning environment in mathematics	6.8	6.9	6.2	0.0165	1.7
Risky behaviour	2.6	2.5	3.4	< 0.0001	7.0
Supportive family	8.5	8.4	7.9	0.0020	2.6
Mean cognitive composite age 12	6.3	5.9	5.6	0.0026	2.5
Mean attitudinal composite age 12	7.2	7.0	6.8	0.0223	1.6
Mathematics age 12	5.4	5.1	4.5	0.0017	2.7
PAT reading comprehension age 12	5.6	5.5	4.9	0.0017	2.0
Logical problem solving age 12	7.1	6.9	6.8	0.0376	1.4

Multi-factor models

Of particular importance in all of these models was overall achievement, derived from the teachers' perceptions of the students relative to their peers. Once this variable was included in the model, decile of the school, current cognitive competencies, maternal qualifications and current family income were not statistically significant. Which other variables contributed significantly to the models varied between outcome variables.

Each table detailing the model where school choice factors are used to explain the variability in the outcome variable is followed by a table for the larger models, including all explanatory variables that had been used in Research questions 6, 7 and 8.

Engaged in school

The larger model included whether the school was the students' first choice, whether they would choose the school again, and overall achievement. An examination of the mean scores for engagement in school in Table 164 above indicates that in fact the significant difference in engagement level was between those for whom the school was not first choice and the relatively small group that was uncertain about this. However, it is generally true that the engagement score of those for whom the school was *not* first choice was lower than that of those for whom it may have been. This model accounted for 25 percent of the variability in engaged in school scores.

Table 165 **Model for engaged in school score using school choice variables**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Overall achievement	0.26	0.03	< 0.0001
School first choice?			0.0111
Not certain	0.74	0.25	0.0034
Yes	0.27	0.15	0.0715
Would choose the same school again?			< 0.0001
Not sure	0.76	0.22	0.0065
Yes	0.91	0.18	< 0.0001

These school choice variables remain significant in the larger model for engagement in school, which accounted for 60 percent of the variability in engaged in school scores.

Table 166 **Model for engaged in school scores using combined set of explanatory variables**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Risky behaviour	-0.31	0.04	< 0.0001
Positive learning environment in English	0.17	0.04	< 0.0001
Negative about English	-0.13	0.04	0.0002
Negative about Mathematics	-0.12	0.03	< 0.0001
Introvert	0.11	0.04	0.0039
Inclusive family	0.09	0.03	0.0060
Internal markers of achievement	0.08	0.04	0.0410
Comparative learning environment	-0.06	0.02	0.0118
Overall achievement	0.06	0.03	0.0164
Cluster variables			
History of enjoyment of reading			0.0206
Mixed responses	-0.25	0.12	0.0420
Mainly/qualified yes	-0.34	0.11	0.0023
Mainly no	-0.29	0.20	0.1403
History of feelings about school			0.0349
Fairly enthusiastic	0.04	0.11	0.6833
Mixed	-0.07	0.12	0.5744
Unhappy at least once	-0.40	0.15	0.0081
School first choice?			0.0390
Not certain	0.43	0.19	0.0283
Yes	-0.27	0.11	0.8143
Would choose the same school again?			0.0041
Not sure	0.30	0.17	0.0779
Yes	0.46	0.14	0.0011

Disengaged in learning

The variables that were significant in the school choice model were whether, with hindsight, the student would again choose the same school, whether the student was involved in the choice of the school, and overall achievement (as judged by their teachers). The model (Table 167) accounted for 14 percent of the variability in disengaged in learning scores.

Table 167 **Model for disengaged in learning score using school choice variables**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Overall achievement	-0.17	0.02	< 0.0001
Student involved in choice of school?			0.0396
No	0.24	0.12	0.0396
Would choose the same school again?			0.0006
Not sure	-0.70	0.21	0.0008
Yes	-0.64	0.17	0.0002

These school choice variables did not remain significant in the larger model for engagement in school. The large model (Table 168) was essentially the same as that formulated for RQ8, with the addition of individual responsibility age 10, and accounted for 59 percent in the variability in disengaged in learning score.

Table 168 **Model for disengaged in learning scores using combined set of explanatory variables**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Disrupted learning environment	0.19	0.03	< 0.0001
Risky behaviour	0.17	0.04	< 0.0001
Negative about English	0.16	0.03	< 0.0001
Comparative learning environment	0.14	0.02	< 0.0001
Positive attitude to Science teacher	-0.10	0.02	< 0.0001
Praise and achievement	-0.09	0.03	0.0010
Friends with risky behaviour	0.09	0.03	0.0003
Positive attitude to Mathematics teacher	-0.09	0.02	< 0.0001
Individual responsibility age 10	-0.07	0.02	0.0013
Cluster variable			
Students' values			0.0127
Anchored/achieving	-0.23	0.09	0.0082
Anchored	-0.24	0.10	0.0182

Absorbed in learning

Overall achievement and whether the school was first choice were significant in the school choice model (Table 169), which accounted for nine percent of the variability in absorbed in learning score.

Table 169 **Model for absorbed in learning score using school choice variables**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Overall achievement	0.13	0.02	< 0.0001
School first choice?			0.0110
Not certain	0.26	0.22	0.2398
Yes	0.37	0.12	0.0027

These school choice variables did not remain significant in the larger model for absorbed in learning, which was exactly the same as that determined in answering Research question 8 (Table 106, page 157), so the model is not repeated here.

Confident at school

Overall achievement and whether, with hindsight, the student would again choose the same school, were significant in the school choice model (Table 170), which accounted for 15 percent of the variability in confident at school score.

Table 170 **Model for confident at school score using school choice variables**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Overall achievement	0.17	0.02	< 0.0001
Would choose the same school again?			< 0.0001
Not sure	0.45	0.20	0.0238
Yes	0.80	0.16	< 0.0001

Only overall achievement remained significant in the larger model for confident at school, which included perseverance age 12, but none of the history variables. The model (Table 171), accounted for 51 percent of the variability in confident at school scores.

Table 171 **Model for positive about confident at school scores using combined set of explanatory variables**

Explanatory variables	Parameter estimate	Standard error	*p*-value
Scale variables			
Internal markers of achievement	0.27	0.04	< 0.0001
Solid friendships	0.22	0.04	< 0.0001
Dissatisfaction	-0.18	0.04	< 0.0001
Inclusive family	0.11	0.03	0.0011
Positive learning environment in English	0.11	0.03	0.0002
Negative about Science	-0.07	0.03	0.0083
Overall achievement	0.05	0.02	0.0508
Perseverance age 12	0.04	0.02	0.0707

11. Results: Research question 12

Research question 12: What personal interest, peer, school, and home factors influence the subject choices which students make at the start of secondary school, and how do these choices relate to their understanding of qualifications and their aspirations?

To answer this question we took a set of our factor scale variables (see Section 2), some cluster variables, some demographic information, and some age 14 and age 12 competencies to investigate subject choice:

- Confident in school (student feels they are treated as an individual, feel they belong and are safe, etc.)
- Positive attitude to English, Mathematics, or Science teacher (student likes them, thinks they are fair and understand student feelings)
- Positive learning environment in English, Mathematics or Science (student feels the teacher gives clear instructions and expectations, is helpful, is interested in the students, etc)
- Negative about English, Mathematics and Science (student plans to drop the subject, doesn't know how to do the work, and does not do well)
- External markers (student measures progress at school by the extent to which they out-perform others)
- Teacher perception of student overall achievement relative to peers
- Solid friendships (student feels friends listen to them, respect them, are trustworthy, are liked by their parents, etc.)
- Family pressure (student feels parent/s are trying to change them, control them, worry about what they get up to, but do not share problems; student does not have enough privacy)
- Inclusive family (student is treated fairly, is comfortable with the family, the family is considerate, and help is given when needed)
- Supportive family (student trusts parent/s, parent/s are warm and loving to them, student feels close to family, family is mutually helpful and supportive)
- Parent view that student is responsible (takes responsibility for getting organised, passes on messages accurately, finishes all chores, etc.)
- Risky behaviour (student has drunk alcohol and/or done something they regretted while drunk, got in trouble with the police, had sex, been in a fight, got into trouble at school, etc.)
- Achievement and praise (being praised for achievements, and also having taken action in positive ways)
- Student related hindrances
- Student leisure activities (clusters: sports players; computer games players/those with no strong interests; all-rounders, interested in reading, arts and sport; those with creative interests)
- Attitudinal competency at age 14: the overall mean measure, and six of the separate measures for perseverance, self management, curiosity, social skills (with adults, and with both peers and adults) and communication
- Cognitive competency at age 14: the overall mean measure, and the three separate measures for reading comprehension, mathematics and logical problem-solving
- Attitudinal competency at age 12: the overall mean measure and the separate measure for perseverance
- Cognitive competency at age 12: the overall mean measure, and the three separate measures for reading comprehension, mathematics and logical problem-solving

We also used four "history factors", summarising the students' past experiences:

- History of TV watching, based on the number of hours of TV watched (mainly low level of watching; mixed; mainly high levels of watching)
- History of homework completion based on reports by teachers (mostly completes homework; varies; mostly doesn't complete homework)

- History of how the student felt about school (always enthusiastic; fairly enthusiastic; mixed; unhappy one or more times)
- Adverse events (student was marginalised, alienated, has suffered loss or family problems; levels none, one item or incident, two or more items)

Demographic variables used were:

- Student gender
- School decile
- School type (Co-educational or single sex boys/single sex girls)
- School size based on total number on school roll

'Outcome' cluster variable

- Subject choice clusters (Technology, Arts, Māori; Technology, Economics/Consumer Studies/Financial Literacy; Māori, Technology, Graphics Design Technology, Supplementary Literacy/English; Technology, Arts, Information Technology, Supplementary Literacy/English, Other languages; Japanese, Graphics Design Technology, Other languages; Arts, Māori; French, Information Technology, Economics/Consumer Studies/Financial Literacy, Text Information Management)

As there was little association between the outcome variable and any of the other variables it was not appropriate to predict subject cluster membership using either a classification tree or discriminant analysis. Instead any continuous variable was grouped into quartiles and, along with the other categorical variables, compared to the subject clusters through cross-tabulations. The level of association was measured using a chi-squared test.

The results are not given in detail in this report, as those of interest are reported in *Growing Independence*.

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