UNIVERZA V LJUBLJANI
FAKULTETA
ZA DRUŽBENE VEDE

Barbara Brečko

THE INFLUENCE OF COGNITIVE AND COMPUTER SKILLS ON DATA QUALITY IN COMPUTER-ASSISTED SELF-ADMINISTERED QUESTIONNAIRES

Master's thesis

VPLIV KOGNITIVNIH SPOSOBNOSTI IN SPRETNOSTI PRI UPORABI RAČUNALNIKA NA KAKOVOST PODATKOV V RAČUNALNIŠKEM SAMOANKETIRANJU

Magistrsko delo

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1 Introduction

"Only fools and children tell the truth."
(Old proverb)

Much research has already been done about data collection. Consequently, the theory of the question-answer process is well-developed. Experts (and novices) in social research can easily access information about questions concerning data quality, methodology, and questionnaire design. In recent years, work on cognitive aspects of survey measurement has also been developing rapidly. Nevertheless, there is one limitation – the theories and practices can be easily applied to the adult population, but there is little known about surveying children.

Children are becoming important respondents in large-scale surveys. Instead of parents or caretakers being informants, children are increasingly becoming the principal informants about their experiences, perspectives, attitudes and behaviors (Scott 1997). When surveying children, researchers can mostly rely upon methodological knowledge about how to survey adults and upon knowledge from child psychology and educational testing. Of course, that knowledge is insufficient. Children possess distinctive cognitive and social developmental characteristics which must be taken into consideration for research design by a researcher who wants to use children as informants. Cognitive development is generally regarded as the umbrella term under which perception, language, memory, reasoning, problem solving and learning are subsumed (Garton 2004). Therefore the process of answering a questionnaire of a child aged nine or ten years, whose cognitive, social and communication skills are still developing, cannot be compared to the answering process of an adult. Findings show that cognitive processes of children differ not just quantitatively, in that adults know more, but also qualitatively, in that children may not think the same way as adults (Mayer 1996: 284).
Interviewing children poses some practical and methodological problems and the current state of knowledge about conducting survey interviews with children is very fragmented. Many problems are to be solved when the respondents are children, including problems of language use, literacy and different stages of cognitive development (Scott 2001).

In recent years, some studies have occurred regarding children as respondents in survey research (focusing on children's cognitive development and response quality). Most of the findings have come from secondary data analyses, where the method of data collection was several self-administered paper-and-pencil surveys, some of them conducted at schools and some conducted at the respondent's home (see Borgers, de Leeuw, Hox 1999; Borgers, Hox 2001). Those studies have shown that vague and ambiguous words should be avoided and that completely labeled response options helped children to give more reliable responses. Detailed findings of those studies will be presented in forthcoming chapters.

Probably the largest studies in which the target population is children are studies in education. Most often, when gathering data from pupils, studies in education use paper-and-pencil methods. Slovenia participates in several school-based international studies (e.g. TIMSS; PISA; PIRLS)[1] where children answer self-administered paper-and-pencil questionnaires.

Since computer-assisted techniques of data collection are rapidly replacing paper-and-pencil methods in the USA and Europe, it is to be expected that in the near future at least some of the school-based surveys will be conducted using computers as a tool for data collection. The use of computerized questionnaires for children as an alternative to paper-and-pencil questionnaires in international school-based studies has not yet been practiced because of several obstacles: one of the biggest is accessibility of computers in school environment (there are countries and schools which are poorly equipped with computers for pupils); and another one is that we know very little about the methodology of surveying children by computer-assisted self-administered questionnaires.

In the year 2006 the first international educational study, SITES 2006,[2] was conducted using a Web-based method of data collection. The target population was teachers of mathematics and science in upper primary school, but for forthcoming studies there are tendencies to collect survey data with computer-assisted self-administered questionnaires also from children.

[1] TIMSS (Trends in International Mathematics and Science Study) and PIRLS (Progress in InternatioAnal Reading Literacy Study) are IEA's (International Association for the Evaluation of Educational Achievement) research studies of the International Study Center at Boston College. PISA (Programme for International Student Assessment) is the OECD's (Organisation for Economic Co-operation and Development) study for international student assessment.

[2] SITES 2006 (Second Information on Technology in Education Study) is IEA's research study among teachers, principals and techical coordinators.

The role of computers in collecting data among adults is increasing and many studies have examined different aspects of adult answering self-administered computer surveys (e.g., Dillman 1998, Lozar-Manfreda and Vehovar 2002).

As known, some theories show that paper-and-pencil methods have certain drawbacks. High costs are one of them and another is that only relatively simple questionnaires can be used. (Dillman 1998).

Previous researches among adults show that self-administered computer-assisted methods can be a solution for cost-related problems; there is no extra data entering, no questionnaire printing, and easy distribution of questionnaires. Computer-assisted self-administered questionnaires (CASQ) can also overcome the problems of complex paper-and-pencil self-administered questionnaires, because computer programs can handle the flow and logic of the questionnaire.

Since suitability of data collection by computer is no longer an issue in social research, it is to be expected that experts in educational survey research will in the near future adopt new methods of data collection also on the international level.

The new school curriculum in Slovenia introduces computer usage in the first three years of education, and schools are quite well-equipped with computers, therefore it can be expected that in a few years pupils in Slovene schools will answer at least some questionnaires on computers (Brečko 2003). According to a Pan-European Survey, all primary schools in Slovenia are equipped with computers and have access to the Internet.

The possibility of gathering survey data by computer in a school setting is challenging; however there are issues that need to be given attention, before applying this methodology. Considerable evidence shows that the method of data collection affects the answers that are obtained. As new methods of data collection are introduced, it will become even more important to understand the differences among them. Different methods of collecting data impose different burdens on respondents' reading, numeracy and listening skills. These burdens are not fixed, but vary with the layout and formatting of the questionnaire (Tourangeau et al, 2004).

In the thesis, our main interest is a study of capabilities of children aged nine and ten years to answer self-administered surveys on computer. The second interest is data quality in computer assisted self-administered questionnaires with children aged nine and ten years.

To answer those questions, children's cognitive and computer skills in the context of answering CASQ have to be studied.

Detailed research questions are:

- Can findings from paper-and-pencil surveys about children as respondents be applied to CASQ as well?
- Is there a difference among pupils who have computer skills and those who do not in answering CASQ?
- What other characteristics of a child affect answering computer-assisted self-administered questionnaires (differences in school achievement, gender, age, reading skills)?

1.1 Structure of the text

In the first part of the text, the role of computers as a data collection tool is presented. There are many different computer-assisted methods for data collection. In this part of the text, the methods and their advantages and disadvantages are presented.

Cognitive functioning is important in the process of answering a questionnaire. Children are considered as a special population in survey research regarding their cognitive skills, which are still developing. Therefore, in the second part of the text the theory of cognitive development is presented. As a basis, Piaget's theory of cognitive development was used. In the empirical part of the study, the respondents' index of cognitive level was computed (it was measured by tests in reading and final grades in mathematics, language and the overall final grade).

In the third part, the cognitive process of answering survey questions is presented. To arrive at a meaningful answer, survey respondents need to perform several cognitive tasks. First they have to interpret the question to understand its meaning and to determine which information they have to provide. They have to retrieve a judgment from memory or make a new judgment. Once a judgment is formed, they have to communicate it to the researcher. To do so, they may need to format their judgment to fit the response alternatives of a question; they may also wish to edit their response before they communicate it, due to influences of social desirability and situational adequacy.

In the fourth part empirical findings about children as respondents to self-administered surveys, mostly paper-and-pencil, are presented. Those findings were used as the methodological basis in constructing the questionnaire for this study. The assumption was that findings from paper-and-pencil self-administered surveys would be very similar to findings from computer-assisted self-administered questionnaires.

In the fifth part the hypotheses are developed and presented.

The sixth part represents the empirical part of the study. In this part results of analyses of computer-assisted questionnaires are presented. Results from paper-and-pencil questionnaires are compared to results from computer-assisted questionnaires.

In the seventh part the results of the survey are discussed.

The eighth part brings conclusions of the thesis and suggestions for further research.

2 Computer-assisted data collection

Over the last 25 years, the application of computer technology to the collection of survey data has revolutionized the survey industry (Tourangeau 2004: 289). Computers were first used in data collection in 1971, when the first computer-assisted telephone interviewing was conducted. Since then, the methods of data collection using computers have expanded. The new computerized methods have not only replaced the traditional paper-and-pencil methods for telephone and personal interviewing, they have also added to the array of methods that can be used to conduct surveys. As Couper states, computer-assisted interviewing has the potential for fundamentally changing the entire data collection process (Couper 1999).

Computer-assisted methods in general are often summarized under the global terms “computer-assisted data collection” or “computer-assisted survey information collection”; in this context the traditional paper methods are denoted as “paper-and-pencil interviewing” (PAPI) (de Leeuw 2003).

Characteristic of all forms of computer-assisted data collecting is that questions are read from the computer screen, and the responses are entered directly in the computer, either by the interviewer or the respondent.

Tourangeau et al. (2004: 292) report the following current methods in data collection:

Table 2.1: Current methods in data collection

Method of contact	Paper-and-Pencil	Computer-Assisted
Telephone	Conventional telephone	Computer-assisted telephone interviewing (CATI) Touchtone data entry (TDE) Voice recognition entry (VRE)
Mail	Self-administered questionnaire (SAQ)	Disk by Mail (DBM)
E-mail, Internet		Prepared data entry (PDE)/ Web-based surveys
In person	Paper-and-pencil interviewing (PAPI)	Computer-assisted personal interviewing (CAPI)

	Self-administered questionnaire (SAQ) Audio self-administered questionnaire (ASAQ)	Computer-assisted self-administered interviewing (CASI) Audio computer-assisted self-administered interviewing (ACASI)

The presented modes of data collection (Table 2-1) differ in several important ways. The most obvious difference is the method of contacting the respondents and delivering questionnaires to them (whether it is telephone, mail, Internet or in person). Although the method of contact may not seem to matter much, it can make a big difference in practice. Respondents are more easily convinced of the importance and legitimacy of a survey in person than by telephone, and as a result, respondents may put more or less effort into responding.

The difference among methods also involves who administers the survey – is it the interviewer or the respondent himself. As known, the active involvement of the interviewer may affect the response process (on the one hand, the presence of an interviewer may be distracting, personal characteristics as well as behavior of an interviewer can affect responses, and on the other hand, the interviewer may help to maintain the respondent's motivation to answer long questionnaires). Self-administering increases the respondent's willingness to give information about sensitive topics and the impact of the interviewer on the data collected may be reduced.

Another difference among methods is the mode of responding. With some methods of data collection respondents give their answers orally, with others they indicate their answers on paper, yet with others, they click on a mouse, enter a number using a keyboard of a computer or press a number on the handset of a touchtone telephone. These different methods of data collecting impose different cognitive requirements from respondents.

Computerized self-administered data collection has many different forms. The oldest and the most often used method is CATI (Computer Assisted Telephone Interviewing) and it no longer belongs in the category of new technology. The key advantage of CATI seems to be the ability to avoid incorrect skips which can be caused by complex paper-and-pencil questionnaires, and therefore item non-response rates for CATI are lower than for PAPI (Biemer and Lyberg 2003).

In survey research, CAPI (Computer Assisted Personal Interviewing) is the computerized variant of face-to-face interviewing. The interview is conducted with a laptop computer, where a program with a survey questionnaire is stored. The interviewer asks the questions and enters the respondent's answers. When the topic of a research is sensitive, it is also possible that during an interview the interviewer passes the computer to the respondent, who then answers sensitive questions on the computer. This method is called CASI (Computer Assisted Self-Interviewing). The new emerging method is audio-CASI. In this method a respondent listens to questions over the headset and at the same time views questions on the computer screen. This overcomes literacy problems and also guarantees the respondent's privacy.

Computer Assisted Self-Administered Interviewing (CASI) is less widely spread compared to other computer-assisted methods (e.g. CATI, CAPI), but as computer use keeps growing, computer-assisted self-administered questionnaires have a promising future (de Leeuw et al. 2003).

Two other computer-assisted equivalents of mail survey are Disk-By-Mail (DBM) and the Electronic Mail Survey (EMS) or Web-based surveys. In DBM a respondent receives a disk in the mail with the interviewing program, runs it on one's own computer and then sends back the disk with responses. In EMS the survey is sent by electronic mail or downloaded from or accessed via the Web. Users of electronic networks, electronic mail systems or bulletin boards receive a request to participate in a survey.

Despite the benefits that computerized self-administered questionnaires bring, we have to be aware of the limitations electronic mail surveys have:

1. There is no readily available software for electronic questionnaires that suit survey organizations using capabilities found in most CAPI and CATI programs, such as skips, edit checks and randomization of response alternatives. The software has to be developed in-house.
2. The questionnaire design capabilities are limited, which restricts the scope of applications.
3. E-mail is based on non-standardized software, with no standardization in sight.
4. Respondent access to modems and communication software is limited.

5. E-mail addresses often change.
6. There are many issues associated with confidentiality and security. Confidentiality must be assured and guarantees must be provided that the installment of the communication package will not make the respondent's computer vulnerable to viruses.
7. Coverage error is a concern, due to limited respondent access to properly equipped PCs and limited modem and Internet access.

(Ramos et al. 1998 in Biemer and Lyberg 2003)

2.1 Visible presence of a computer

Apart from the technical aspects of using computer, the visible presence of a computer itself may affect the data quality. De Leeuw et al. (2003) state that compared to the traditional PAPI methods, the visible presence of a computer can affect how the respondents or the interviewers perceive the interview situation in three ways:

1. Less privacy. When a respondent is unfamiliar with computers there could be a "Big Brother" effect, leading to more refusals and socially desirable answers to sensitive questions.
2. More privacy. Using a computer could also lead respondents to expect greater privacy. Responses are entered directly into computer and can not be read by anyone. In societies where computers are widespread and familiar this effect is more likely to occur than the Big Brother effect.
3. Trained interviewers may feel more self-confident using a computer, and behave more professionally. This behavior could lead to more confidence of the respondent in the interviewing procedure.

2.2 The effect of computer data collection on the data

One of the most obvious and most often reported effects of the computerization of surveys is the decrease in the amount of missing data which occurs because of routing and skipping errors. The reduction in missing data has been demonstrated in several studies of computer-assisted data collection (e.g., Baker et al. 1995, Tourangeau et al. 1997 and others in Tourangeau et al. 2004).

But on the other hand, several studies find higher item non-response with computer-assisted data collection compared to traditional paper-and-pencil methods. (Lozar Manfreda, Vehovar 2002)

Most of the authors who have compared different modes of data collection have not found much difference between the responses obtained by paper-and-pencil mode and computer-assisted mode, although differences can be found when questions touch personal aspects (e.g. de Leeuw et al. 2003). Even more, respondents are found to be more willing to report behavior about sensitive topics on computer-assisted questionnaires than to paper-and-pencil questionnaires. The effect of computerization on the quality of the data in self-administered questionnaires has also been a concern in psychology testing. In general, no differences between computer-assisted and paper-and-pencil tests were found in test reliability and validity (Harrel and Lombardo 1984; Parks et al. 1985 in de Leeuw et al. 2003; Honaker 1988 in Tourangeau et al. 2004).

Most authors comparing different modes of data collection haven't found much difference between the responses obtained by paper-and-pencil mode and computer-assisted mode.

Most of the studies done have concentrated on response rates, completion rates and the representativeness of the samples, but very few have addressed the question whether respondents provide different information depending upon the mode of the questionnaire delivery.

2.3 Cognitive burden in CASQ

To date there have been few studies on the impact of the channel of presentation and the mode of responding (Tourangeau et al. 2004: 302). However, the method of data collection affects the cognitive requirements placed on respondents, in particular, the demand for literacy. Methods of data collection where questions are presented visually and the respondent must answer by pressing a key – typically a number on a keyboard (as in CASQ) – represent one of the extremes of cognitive difficulty. The respondent must be able to read, recognize numbers and key their answers accurately. The level of cognitive burden may affect the proportion of sample able to participate in a survey as well as the rate of missing values or reliability of the obtained data of those who take part.

Because computerization and self-administration are becoming more widely adopted in surveys, new design principles are proposed in order to reduce cognitive burden on respondents and interviewers. Couper argues that a well-designed computer-assisted data collection system should exhibit ten characteristics:

1. Functionality – the system should meet the requirements for carrying out the tasks.
2. Consistency – the system's conventions and mappings between actions and consequences should be the same within a questionnaire and, if possible, across questionnaires and other interview tools.
3. Informative feedback – the system should provide feedback, such as confirmation messages or movement to the next screen for every user action.
4. Transparency – the system should carry out certain functions, such as checking that the answer entered corresponds to one of the options, without drawing the user's attention to them.
5. Explicitness – the system should make it obvious what actions are possible and how they are to be performed.
6. Comprehensibility – the system should avoid jargon, abbreviations, and arbitrary conventions.
7. Tolerance – the system should allow for errors, incorporating facilities to prevent, detect, and correct errors.
8. Efficiency – the system should minimize user effort.

9. Supportiveness – the system should recognize the cognitive limits of the user and make it unnecessary for them to memorize large numbers of commands, providing ready access to online help instead.
10. Optimal complexity – the system should avoid both oversimplification and extreme complexity.

(Couper 1994 in Tourangeau et al. 2004)

2.4 Technological possibilities

Computer-assisted interviewing is expanding because it offers advantages for a researcher as well as for a respondent.

De Leeuw and Nicholls (1996) report five advantages of the (optimally implemented) computer-assisted interview over (an optimally implemented) paper-and-pencil interview:

1. There are no routing errors. If a computer system is correctly programmed, errors in the question order – skipping and branching – do not occur. Based on previously given answers the program decides what the next question must be and so both interviewer and respondent are guided through the questionnaire. Missing data because of routing and skipping errors do not occur.
2. Data can be checked immediately. For instance, range checks in which the program can refuse the response '8' to a seven-category Likert scale and prompt the respondent to correct the response.
3. The computer offers new possibilities for formulating questions. For instance, the possibility of randomizing the order of questions in a scale, giving each respondent a unique question order. Response categories can also be randomized, which avoids question format effects.
4. No separate data entry phase. The first tabled results can be available soon after the data collection phase.

The knowledge that the system accurately records information about the interview process itself inhibits interviewers from cheating. Computer-assisted interviewing provides a research organization with greater interviewer control and offers a protection against unwanted interviewer behavior.

Despite rapid development of different computer-assisted data collection methods, paper-and-pencil methods are still widely used. These latter methods are also used in international educational surveys such as TIMSS and PIRLS where a number of teachers, the school principal and whole classes of students from the school are sampled. The number of students involved in these surveys is 20 to 40 at a time. Because of big samples the most appropriate method for data collection has been paper-and-pencil self-administered questionnaires. The questionnaires are sent by mail to schools (in some cases an interviewer brings questionnaires to school, but does not perform interviews).

Usually the conduction of computerized surveys requires a special population – respondents who have access to a computer. Conducting a computerized survey in a school setting equipped with computers therefore assures that every child, teacher and the principle has access to computer and that no one is left out just because he/she does not have access to a computer at home.

3 Cognitive processes of answering a survey question

Regardless if a survey is conducted via paper-and-pencil questionnaire or computer-assisted questionnaire, answering a survey question involves a series of cognitive tasks that a respondent has to solve in order for the researcher to extract high quality data. These tasks include understanding and interpreting a question, conducting a memory search, making judgments and selecting a response (e.g., Tourangeau 1984; Sudman et al. 1996).
Tourangeau (Tourangeau et al 2004) proposes the following model of the response process:

Component	**Specific Processes**
Comprehension	Attend to question and instructions
	Represent logical form of a question
	Identify question focus (information sought)
	Link key terms to relevant concepts
Retrieval	Generate retrieval strategy and cues

	Retrieve specific, generic memories
	Fill in missing details
Judgment	Assess completeness and relevance of memories
	Draw inferences based on accessibility
	Integrate material retrieved
	Make estimate based on partial retrieval
Response	Map judgment onto response category
	Edit response

When answering a survey question a respondent does not need to carry out all the described processes. The set of processes used depends on many factors, such as the nature of the question, the amount of time the respondent has to answer a question, the respondent's desire for answering accurately, and others.

Each component can influence the response effects – respondents may misinterpret the question, forget important information or map an answer to an inappropriate response category. When the surveyed population is young children, whose cognitive skills are still developing, researchers should pay even more attention to their response process and the errors that can occur during that process.

Each of the described components can produce response errors which lead to poor data quality in a survey. During the **Comprehension** component, errors can occur due to the misunderstanding of a question or instructions and misfollowing of instructions. For instance, in the questionnaire (TIMSS 2003) there was an attitude statement: "I usually do well in mathematics", due to poor translation, the statement in Slovenian language was "Pri matematiki sem ponavadi dober." (I am usually good at mathematics.). In the Slovene schooling system "dober" (good in English) also means grade mark 3 (grade marks are from 1 (very bad) to 5 (excellent)). Some of the respondents missinterpreted the statement as: "In mathematics I usually get grade mark 3", which is very different from the original meaning of the statement. In self-administered surveys respondents may not be familiar with terms used in questions or the terms are misunderstood and thus respondents may intentionally or unintentionally skip questions and instructions. In paper-and-pencil self-administered studies there might be an instruction to intentionally skip a question – if a respondent does not follow the instructions correctly and hence does not skip the question, we get errors which result in poor quality data. These errors can be avoided with computerized surveys, because skipping questions is automated, there is no need for a respondent to think about which questions should be skipped.

Retrieval is a component which involves the recollection of relevant information from long-term memory. The greater the demand a question places on memory, the less accurate the respondents' answers. Regarding children, "…there is a great deal of evidence that there are marked changes in the use of memory strategies as children grow older. Strategies are deliberately controlled mental or behavioral activities used so as to enhance memory performance by improving the encoding, the storage or the retrieval of information" (Meadows 1993: 54). Because older children use memory strategies they are capable of remembering more.

For the **judgment** component, we notice that in some cases, respondents may have direct access to a previously formed relevant judgment that they can offer as an answer. In most cases, they will not find an appropriate answer readily stored in memory and will need to form judgment on a spot.

The final component of the model is **response.** Even when a respondent has a clear answer to report, it may not be clear to him how to report it. The response options offered by the questions can be unclear to a respondent – for instance, where is the exact boundary between "strongly agree" and "agree"? What frequency of an event is necessary to qualify as "often" or "seldom"? Beyond the difficulties respondents may have with particular answer categories, they may differ in their approaches to selecting an answer.

3.1 Satisficing model

In recent years other models of the survey response process have also appeared. One of the models which we think is important in understanding the answering process of a child is the **satisficing** model, presented by Krosnick and Alwin (1991). Krosnick and Alwin distinguish between respondents who optimize and those who satisfice in answering survey questions. **Optimizing** means that a respondent goes through all four cognitive components when answering a survey question, while in **satisficing** the respondent goes through the cognitive process less thoroughly.

Since each of the four components of the cognitive process can be quite complex, and involve a great deal of cognitive work to generate an optimal answer to even a single question, the cumulative effort required to answer a long series of questions on a wide range of topics is very important. Although the hope of every researcher is that respondents will optimize throughout the questionnaire, this is unrealistic. Some respondents may agree to complete a questionnaire through a relatively automatic compliance process. They may agree to provide answers, but with no motivation to give high quality answers. This could also be the case with surveys conducted in a school setting where all students answer the questionnaire because they feel they have to. Some respondents may provide high quality data in the beginning of the questionnaire, but then become tired or distracted as the questionnaire continues.

According to Krosnick (1999), satisficing is not so much a strategy for choosing among response options as an overall approach to answering a question. Respondents may simply be less thorough in comprehension, judgment and response selection. They may consider a question’s meaning less thoughtfully; they may search their memories less comprehensively; they may integrate retrieved information carelessly; and they may select their response imprecisely. All four steps are executed, each one less thoroughly than when optimizing occurs. Instead of generating the most accurate answers, respondents settle for satisfactory ones. According to Krosnick (1999), three factors foster satisficing:

a) the greater the task difficulty,
b) the lower the respondent’s cognitive ability,
c) the lower the respondent’s motivation to optimize.

The **task difficulty** is a function of the difficulty of interpreting the meaning of a question and response categories, the difficulty of retrieving and manipulating information in memory, the pace at which a respondent (or interviewer) reads, the occurrence of distracting events and other.

Cognitive ability is presumably greater among respondents who are more skilled at performing complex mental operations or who are practiced at thinking about the topic of a question and creating judgments on the issue.

Factors influencing a respondent's **motivation to optimize** include the need for cognition, the personal importance of the question's topic to the respondent, fatigue, and others.

Respondents can satisfice in a number of ways to arrive at a satisfactory answer without expending too much effort. A respondent may choose the first reasonable response on the list rather than carefully processing all the possible alternatives. Or one might offer neutral point on the rating scale or "don't know" answer, to avoid expending the effort necessary to consider and possibly take more risky stances. In the extreme, a respondent might randomly select a response.

Therefore respondents using satisficing strategy produce less reliable responses than respondents using optimizing strategy.

4 Children as respondents

"…the child is not a small grown up, but has needs of his own, and is mentally adapted to this needs." (Piaget 1924: 90)

Survey research with children is mostly in a domain of developmental psychologists, child psychologists and researchers in education. Children are most often excluded from general surveys for at least four reasons:

1. Inertia of practice – even when the subject matter requires information about children, most studies interview only adults, using their information about children.
2. Children may be omitted because of the tendency to accredit adults with greater knowledge, experience and power.

3. Interviewing children is viewed as too problematic. Interviewing children poses practical as well as ethical issues which researchers might wish to avoid.
4. Children are believed to lack the communication, cognitive and social skills which are the prerequisite of a good respondent.

(Scott 2001)

Research methods that involve children as respondents have to take into account the wide range of cognitive and social development depending primarily on age, but also on gender and socio-economic background. It is clear that standard questionnaire techniques cannot be used for surveying preschool children, but less structured methods of interviewing can be appropriate for young children.

In interviewing children the context is of great importance. Home and school are the two most important social worlds for children and in the matter of context Scott argues that the interview setting can influence children's responses (Scott 2001). Generally, the school setting is more cost effective than interviewing children at home. But there are certain drawbacks – most often the classroom surveys use self-administered questionnaires, and here difficulties with literacy and motivation can occur. Yet another problem of the classroom setting is the proximity of peers. Even if the answers are supposed to be confidential, children discuss their answers and can be influenced by peers.

Conducting a survey with children at home is more time consuming and therefore more costly. And again there is the possibility that children's answers are influenced by the presence of parents or siblings. Interviews in home settings are usually carried out in person and Scott (2001) discusses advantages of the method over self-administered methods, which are usually used in schools. One of the advantages Scott sees is the possibility to include more complex routing, the second is the possibility to use visual aids (cards) and the third advantage is the possibility to prompt for further information when answers are inadequate due to lack of communication skills.

In the forthcoming section we present the developmental stages and their relevance for surveying children.

4.1 Developmental stages and their relevance for surveying children

“Psychologists using the information-processing approach to the study of cognition and cognitive development describe cognition as largely a matter of handling information in order to solve problems. They are primarily concerned with how information is selected, represented, stored, retrieved, transformed, and so forth.” (Meadows 1993: 212)

Piaget’s theory of cognitive development will serve as a tool for global classification of developmental stages of children. We are well aware that Piaget’s theory has received much criticism, mostly based on two accounts:

Method: The clinical method he used is too loose and lacks good experimental control. For example, Roshental and Jacobson (1968) have shown that the experimenter can influence subjects in subtle ways, such as facial expression, without being aware of it. In addition, Piaget’s method depends heavily on language concepts which young children may not use in the same way as adults (Mayer 1996: 287).

Theory: The theories are too general and vague. They are sometimes even not testable in a clear experiment, and those theories which are testable have often been shown not to hold up (Gelman 1996).

Despite the criticism, Piaget’s theory is quite valuable for survey researchers. The fact is, children’s cognitive capacities increase with age and the basic levels of cognitive development are important for understanding the question-answer process when surveying children, and for discovering where children may differ from adults. We are aware that the transition from one stage to another is not as clear as assumed, but for the purpose of the study, the directions of cognitive development are more important than the actual stages.

According to Piaget’s stage dependent theory, progressive changes in cognitive structure happen in the following fixed stages (Piaget in Mayer 1996):

1. Sensorimotor period (birth to 2 years);
2. Preoperational period (2 to 4 years);
3. Intuitive thought (4 to 7 years);
4. Concrete operations period (7 to 11 years);
5. Formal operations period (11 years to adult).

The age norms given should not be taken too strictly. Although they are the ones suggested by Piaget, the critical issue is the order of the stages and not the specific age at which each stage is supposed to occur.

4.1.1 Sensorimotor and preoperational periods

Until the age of two (sensorimotor period) children represent the world in terms of action – sucking, looking, dropping and so on, and perform operations and manipulations on actual objects rather than on internal representations (Mayer 1996: 291). During this phase, infants learn to coordinate their senses with motor behavior.

At the end of the sensorimotor period and at the beginning of the preoperational period the child has made some startling advances, including sensorimotor coordination of the rudiments of symbolic problem solving. Yet children at this stage deal with static, concrete images and are limited by the following six problems (Philips 1969 in Mayer 1996):

1. *Concreteness* – the child can deal only with concrete objects which are physically present here and now.
2. *Irreversibility* – the child is unable to rearrange objects mentally or to conceive of them in some arrangement.
3. *Egocentrism* – the child believes that everyone sees the world through his eyes and that everyone is experiencing what he is experiencing.
4. *Centering* – the child can attend to only one dimension or aspect of a situation at the same time.
5. *States versus transformations* – the child focuses on states, on the perceptual way things look rather than on the operations that produced the state.
6. *Transductive reasoning* – the child reasons that if A causes B, B causes A.

It is not recommended to interview children in these phases. For these two periods, observation and parents' reports are used as methods for collecting information about children.

4.1.2 Intuitive thought

At about age four children enter into the period of intuitive thought. Children in this stage are developing the basic skills necessary for successful verbal communication. However, there is still a tendency to focus attention on one aspect of an object while ignoring others. Concepts formed are crude and irreversible and reality is not firm – children in this stage still believe in magical increase, decrease, disappearance. This group is still limited in their language development, which implies limitations in comprehension and verbal memory.

Children in this age group can be interviewed, but very carefully. For this age group visual stimuli can be very useful in the interview process, because pictures make the issue more concrete than just verbal representation. Qualitative methods of research are appropriate in this period – for instance, observation with carefully planned structured interviewing. As Woodhead and Faulkner (2001) show, the context (environment) of the research study and the researcher–child relationship is very important in this period.

4.1.3 Concrete operations

Children aged seven to eleven years are in the stage of concrete operations. The term concrete operations comes from the ability to mentally operate or change concrete situations and to perform logical operations in one's head. In this stage children develop language skills and acquire reading skills. Although there are many new mental operations that begin to emerge throughout this period, children still have problems applying concrete operations to abstract situations (Mayer 1996).

From 9 to 11 years of age, egocentric speech gives way to a form of verbal and conceptual syncretism characterizes by a need for justification at any price. In his desire for understanding, the child of this age jumps too fast from premises to conclusions, attempts to link everything vit everything. In verbal syncretism the child tends to drop difficult words in a narration or a sentence and to link all the easy words with one another so that he can, afterwards reinterpret the difficult words he missed in a first place. (Piaget 1923: 66)

The stage of concrete operations overlaps with the third stage in reading development (Chall 2004). At about age eight a child enters the stage "Reading for learning the new". At this stage a reader uses reading as a tool for acquiring new knowledge. Yet, "... reading in this stage is essentially for facts and the reader typically comprehends from a singular viewpoint"

(Chall 2004). This means that children in this stage tend to be very literate. This has also been shown by Borgers and Hox (2000) and Borgers (2002). The studies have shown that vague quantifiers and ambiguous words should be avoided and that completely labeled response options help children to give more reliable responses. Children at this stage also have problems with negatively formulated questions, because they have not yet developed the formal thinking skills which are necessary to understand logical negations.

Children at this stage can be surveyed by self-administered questionnaires, although special care should be made when designing the questionnaire.

4.1.4 Formal thought

By early adolescence, at about age eleven, the formal operations period begins. During this period a child develops the ability to think in terms of the hypothetical, in terms of probabilities and in terms of the possible rather than the concrete here and now.

According to the stages of reading development at about age fourteen, a child enters the stage of “multiple viewpoints” – the reader begins dealing with learning from multiple viewpoints. Readers grow in their ability to analyse what they read and react critically to the different viewpoints they encounter. They are able to deal with layers of facts and concepts and have the ability to add and delete schema previously learned (Chall 2004).

Young people aged sixteen and more are treated as adult populations in survey research.

5 Previous research

There is little documentation about young children as respondents in computerized surveys. Most of the findings about children as respondents to a survey questionnaire come from paper-and-pencil studies, where a lot of research has been done by N. Borgers. A lot of her work is dedicated to response quality in relation to cognitive development of children. Her work and findings have served as a basis for us for the study of children as respondents to computerized questionnaires. Other researchers also working in this field are: M. Fuchs, E. de Leeuw, and J. Hox. Here we briefly describe and summarize Borgers’s and other authors findings about children as respondents.

5.1 Influence of cognitive development on data quality

In the article "Children as Respondents in Survey Research: Cognitive Development and Response Quality" (2000) Borgers et al. discuss stages of cognitive development according to Piaget and the influence of the stages on question answer process. In the article they discuss two studies in which the target population was primary school children. The first study was conducted in 1997[3], in this study Borgers reanalysed data which had been collected for the evaluation of a reading simulation program. The sample consisted of 443 children aged seven and eight years, the data was collected in a classroom setting, where the questions were read aloud by an instructor and children recorded their answers on a self-administered paper questionnaire. As background data, individual scores on several educational tests (vocabulary, reading decoding, and two tests of reading comprehension) were available. Based on the background data, respondents were assigned to four groups (indicating whether a child was a good performer on a specific test or not). The groups were compared regarding the quality of data on the reading attitude test. Two data quality indicators were used: internal consistency (Cronbach's coefficient alpha) on reading attitude scale and the item non-response on the reading attitude scale. Borgers found that reading ability influenced the item non-response on the attitude questionnaire. Children who achieved low reading scores produced more item non-response. Language ability also influenced the consistency of their responses on the attitude test. The study found that children with lower cognitive abilities produced less reliable data on paper-and-pencil questionnaires.

In the second study, Borgers et al (1999)[4] investigated the influence of child characteristics and cognitive growth on data quality. The authors reanalysed questionnaire data with children as respondents. There were three large data sets available. All data were collected in a classroom setting, using self-administered paper questionnaires developed for children. The studies included different age groups and were aimed at different topics, asking for different types of information. No direct measures of cognitive development were available; therefore

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[3]Borgers, N. (1997). De invloed van taalvaardigheid op datakwaliteit bij vragenlijstonderzoek onder kinderen (In Dutch: The influence of language and reading ability on data quality in questionnaire research with children). University of Amsterdam, Department of education (POW), unpublished report.
[4] Borgers, N., de Leeuw, E., Hox, J. (1999). "Surveying Children: Cognitive Development and Response Quality in Questionnaire Research." In: A. Christianson et al. (eds). *Official Statistics in a Changing World*, 133-140. Stockholm: SCB.

gender and year of education were used as proxy indicators for cognitive development. Again, two indicators of data quality were used: Cronbach's alpha and item non-response on the multi-item scales. Borgers et al. (2000) concluded that gender and years of education have an influence on the internal consistency of the scales. With regard to proportion of non-response they found that the association with gender was significant – boys had slightly more item non-response than girls. The number of years of education also produced a significant effect. Young children in the beginning of schooling produced more item non-response. The findings supported their hypothesis that data quality increases with cognitive growth.

In another study, Borgers and Hox used secondary data analysis on five different data sets, collected in the field of educational research. The research question of the study was: "What are the effects of child characteristics and question characteristics (and their interaction effect) on the reliability of responses produced by children in self-administered questionnaire research?" The authors showed that both child characteristics as well as question characteristics affect the reliability of responses of children in self-administered questionnaire research. Regarding child characteristics it was shown again that younger children, less cognitively sophisticated respondents, produce less reliable responses compared to older children. Besides, girls give more constant responses than boys. The findings supported their hypothesis that reliability of answers increases with cognitive level.

Regarding question characteristics they focused on several topics – sensitive questions, use of reference period, don't know filters, and wording of the questionnaire. They found that sensitive questions have a positive effect on the reliability of responses. The data showed that the youngest children produced less item non-response when they were asked sensitive questions. Borgers and Hox suggest that this result might be caused by children's involvement in the topic of the question. Yet another explanation could be that young children are more sensitive to social desirability, which can cause consistent responses but does not reflect their own opinions.

The authors found that the use of a reference period in a question produces more reliable responses. Young children are very literal in the interpretation of questions and reference periods can help them with the interpretation. They also reported about the use of don't know filters which increased the reliability of responses in the study. However, they reported that don't know filters increased unusable responses. Don't know filters can also discourage

respondents to report their opinion. Therefore, it is not recommended to use don't know filters, despite the result that these filters increase the reliability of responses.
Hox and Borges also reported on question characteristics which should be avoided in questionnaires for children. It is recommended to avoid negatively formulated questions.
The second characteristic which should be avoided is described as the use of ambiguous words. Ambiguous response scales decrease reliability of responses. Authors also report the negative effect of response options. They suggest avoiding too many response options in questionnaire research with children. Reading and interpreting too many different response options can place a burden on children because of cognitive demands.
Within the study it was found that the position of the question in the questionnaire has an effect on the reliability of responses.

Borgers and Hox also investigated the effect of item and person characteristic on item non-response for written questionnaires used with school children (2001). Secondary analyses were done on five different data sets. Their study indicates item characteristics that may be considered when designing a questionnaire for children. The first important item characteristic is the position in the questionnaire. They suggest randomizing the position of the question in the instrument to randomize item non-response. In that way the proportion of item non-response is randomized over items and not systematically the largest for the items in the last part of the questionnaire. The second important characteristic is using a clear and extensive introductory text in a questionnaire, which prevents item non-response to some extent. They suggest to adapt the number of response options to prevent loss of information and recommend the use of four or five response options.

In the article "Response Effects in Surveys on Children and Adolescents: the Effect of Number of Response Options, Negative Wording and Neutral Mid-Point" Borgers et al. (2004) discuss a methodological survey experiment on the effect of negatively formulated questions, the number of response options and offering a neutral mid-point as a response option and question characteristics on the reliability of the responses, using children and young adolescents as respondents. In the experiment, children (aged from eight to sixteen years) in the telepanel households were asked to answer the questionnaire. The method of data collection was computer-assisted self-interviewing. The questionnaire was administered twice – in the first administration 222 children participated and in the second, 91. The results of this study did not show an effect of negatively formulated questions on the reliability of responses in general. The result was surprising since it is not in accordance with the satisficing theory and the empirical results found with adults (Knauper et al. 1997) and children (Benson and Hocevar 1985, Borgers and Hox 2000). The most stable result found in the study was the effect of the number of response options on the reliability of responses. The stability of responses within the scale increased with the number of response options offered, up to six options. Earlier studies had shown that the more response options offered, the less reliable the responses and the more item non-response produced. The results are not as clear with children as they are for adults, for whom increasing the number of response options definitely increases the reliability of responses, with an optimum number of response options being around seven.

Borgers et al. (2002) also report about the effect of labeled response options and vague quantifiers in survey research with children. The authors reported that in general, children produce smaller differences over time if the response options are completely labeled. However, these main effects disappear after including the interaction effect between age and labeled response option. The positive effect of offering completely labeled response options remains only for children aged over ten or eleven years. Contrary to the expectations, the study did not show that younger children had more difficulties with cognitively demanding questions. All age groups are equally affected by the more difficult question format, partially labeled response options. On the contrary, young children did not benefit from the extra information that is offered in completely labeled response options. Younger children (less than ten years old) produce responses with a certain amount of error that was stable across the different conditions. Apparently, all questions are difficult questions for them. Only older children (over ten or eleven years old) can take advantage of completely labeled response options, because their cognitive abilities make it possible for them to understand and interpret all given information in the question. Regarding vague quantifiers Borgers et al. concluded that offering the clearest type of response options produced the best data quality in questionnaire research with children.

Fuchs (2002) conducted a study demonstrating that children are subject to a similar cognitive process as adults, but to a different extent, due to their limited cognitive skills. He analysed the impact of age and educational achievement (as proxy indicators of cognitive functioning) on the size and the direction of the response effects. He used data from three field experiments which were originally designed to investigate the effect of child characteristics on respondent behavior. The target population of the surveys were children and juveniles aged from ten to twenty-one years. The method of data collection was paper-and-pencil. Within the study he found that younger children and juveniles as well as respondents with less advanced school achievement were less likely to ignore contextual information when decoding the question meaning, compared to older respondents or respondents with better school achievement. Secondly, he showed that respondents with well-developed cognitive functioning more thoroughly process a question when retrieving a response. For younger children and juveniles, as well as for respondents with intermediate or poor school achievement, larger response effects were found.

Van Hattum and de Leeuw (1999) and de Leeuw et al. (1997) report about Disk-by-Mail survey (which is one of the forms of CSAQ) among young children and adolescents from the Netherlands. The purpose of the study was threefold: 1) to test the feasibility of computer-assisted data collection for pupils in primary schools, 2) to determine if CSAQ improves the quality of the data when children are surveyed and 3) to compare costs of CSAQ mode to PAPI mode.

The study was conducted in 1995, the population surveyed was children aged eight to twelve years old. Children completed the questionnaire individually – meaning that computers were standing in secluded corners and respondents went there individually. With the study van Hattum and de Leeuw showed that a Disk-by-Mail survey can be successfully implemented in Dutch primary schools. Children from the age of eight years can successfully complete a computer-assisted self-administered questionnaire and enjoy it. Data quality in the computer-assisted group was better than in the paper-and-pencil group. Criteria for data quality were the amount of missing data, internal consistency of multi-item scales and self-disclosure. Van Hattum and de Leeuw report that a higher percentage of missing data occurred in the PAPI version ($p=.00$). When internal consistency on multi-item scales for the PAPI version and the CSAQ version was compared, there were no or very small statistically significant differences

between the two modes. The authors also report that the CSAQ version resulted in more openness and self-disclosure.
The authors also compared costs for both modes and conclude that the CSAQ mode results in considerably less costs for each completed questionnaire compared to the PAPI mode.

Beebe et al. (1997) are one of the few authors who conducted a comparison between on-line questionnaire versus paper-and-pencil version from a large school survey of adolescents. In the article they discuss methods and issues in the construction of the online version of a school survey of adolescent attitudes and practices on health matter, including several highly sensitive topics. They found that school setting is interesting environment to counduct a comuterised survey, although the proximity of computers and the potential visibility of responses on large screens may compromise privacy.

The previous studies – where respondents have been children – show that the stage of cognitive development affects the quality of the data in the questionnaire; cognitive development mostly influences the reliability of the data and the amount of item non-response. There are question characteristics to which a researcher should pay attention when surveying children: sensitive questions provide reliable answers, but the issue is whether children provide their own opinion when answering such questions. When asking about time it is important to use a reference period, as it helps young respondents to correctly interpret the question. For lessening cognitive burden of a respondent it is recommended to avoid negatively formulated questions and ambiguous words. The number of response options should be between four and five, as too many response options also means cognitive burden for a child.
One of the studies (van Hattum and de Leeuw 1999) showed that computer-assisted data collection is appropriate as a data collection method for young children.

6 Hypotheses

The target population in our study are children aged nine and ten years, children who are at the stage of concrete operations in cognitive developmental theory. According to reading theory, reading in this stage is essentially for facts and the reader typically comprehends from a singular viewpoint. Children at this stage are already capable of answering carefully developed self-administered research questionnaires. In Slovenia children of this age group are already involved in self-administered studies (e.g., TIMSS, PIRLS) conducted by paper-and-pencil questionnaires, and computers have proven to be a reliable data collecting tool among the adult population. These facts and findings from previous research provide us with the foundation for the null hypothesis that there is no difference in the results obtained using paper-and-pencil questionnaires and Web-based questionnaires. Since cognitive skills of children are still developing, children are treated as a special population in survey methodology. It is our belief that the level of cognitive development influences the quality of the data collected by self-administered questionnaires, but the computer, as a tool for collecting data, does not represent an additional burden in the answering process.

The first hypothesis is: “Cognitive skills have an influence on reliability of data collected by CSAQ, but reliability is not lower than in paper-and-pencil collection mode.”

The second hypothesis is: “Computer skills do not have a significant influence on quality of data in CSAQ.”

The third hypothesis is: “Children give less item non-response in computer questionnaires than in paper-and-pencil questionnaires.”

In order to get answers to research questions and to test hypotheses, several steps had to be taken. In the first step of the study, pupils aged nine and ten years were surveyed. The sample consisted of 135 pupils from 7 different schools (two big schools and five smaller schools). The whole class participated in the survey. In the first part of the survey, children’s cognitive skills were measured by tests in reading.

In the second step, children answered a computer-assisted self-administered questionnaire. The method is also known as Computerized Self-Administered Questionnaire (CSAQ), Computer-Assisted Self-Administered Questionnaire (CASAQ) or Prepared Data Entry (PDE). The main characteristic of the method is that the respondents themselves read questions on the screen and enter their responses on the computer. In that mode the computer program guides the respondent through the questionnaire and the interviewer is not needed. The presence of an interviewer is not exclusive in a computerized questionnaire. An interviewer may be present for instructions and assistance; in our study an interviewer was present in the classroom.

The last part of the study was group discussion. In this part a researcher discussed the computerized questionnaire with children.

7 The Study

The study was conducted at the end of a school year (it took place from 7th to 17th June, 2004). Seven schools from Ljubljana and the surroundings were randomly selected. At those schools, a class from the third or fourth grade was sampled. The grade was selected according to the schooling system – at the moment in Slovenia there are two schooling systems – eight years of school and nine years of school. In the nine years schooling system children enter school at six years of age, while in the eight years schooling system children enter school at seven years of age. If a school had the eight years schooling system, children in the third grade were sampled, and if the schooling system was nine years, children in the fourth grade were sampled. That way the respondents from two different grades were the same age. 135 pupils were included in a survey.

An invitation letter to participate in the study was sent to the principals of nine schools. In the letter the purpose of the study was explained. After a week each school was contacted by telephone, when they were again invited to participate and the date of a visit was set. Since a list of classes at each school was available in advance, random class selection was made before contacting schools. Headmasters had no influence on class selection. Only one school declined to participate because they had other projects running. At one school which had been

prepared to participate, the survey was not conducted because the teacher of the selected class became ill presenting difficulties to organize the survey in the class.
In general, the school staff was highly interested in the project and all pupils were excited about answering the computerized questionnaire. Children mostly considered our visit to the school and taking part in the computerized survey as a reward.

Two trained persons from the Educational Research Institute administered the survey. In the first part of the survey pupils got to read a text, a short story, and then they answered nine questions regarding the text. The method used in this part was paper-and-pencil. The story and the questions were pre-tested in a field trial of IEA's[5] PIRLS 2001 (Progress in International Reading Literacy Study) research. On the first page of the test, each child had a written ID (three digits indicating a school and a child) and short instructions about the test. The second part was a computer-assisted self-administered survey (http://ankete.cati.si/neza/). It consisted of 63 questions. The ID from the test later had to be re-entered in the computerized questionnaire so that the two databases could be merged. While pupils were answering the computerized questionnaire, they were observed by a researcher and administrator who recorded their observations, such as difficulties noticed at completing the computerized questionnaire, comments children gave, and children's behavior.
The third phase was a short group discussion with children about the computerized survey.
Altogether it took 60 minutes to conduct all three phases of the research survey.

7.1 Difficulties at Schools

All schools in Slovenia are relatively well-equipped with computers. Each school has at least one computer room with Internet access on all computers. Before starting the survey we were already aware that in some schools computer rooms are too small for all pupils from a class. Thus we split the pupil groups in half in three schools because of too small computer rooms. One half of pupils first answered the questionnaire on computers in the computer room, while the other half was in the classroom conducting the reading literacy test. When both groups finished their parts, they changed. That was possible because both parts of the survey took

[5] International Association for the Evaluation of Educational Achievement

approximately 20 minutes. When both parts of the survey were conducted, we gathered all pupils together and talked about the computerized survey.

Another problem was that computers in computer rooms are set quite close to each other and because of this it was sometimes difficult to avoid communication between children. Some of them compared questions and answers, checking how far a schoolmate had come in the questionnaire. All pupils who were talking were instructed that it is important that they complete the survey without talking and told not to disturb other children.

7.2 Reading literacy test

The reading literacy test was used as one of the measures of a child's cognitive level. The test consisted of a three-page story and nine questions. Two questions were open-ended and others were closed. A child had to read the story and then answer the questions about the story. For each correct answer the pupil got five points, for correct open-ended answers a child received 10 points. The maximum number of points was 65. The time allowed to complete the test was unlimited. The test was pre-tested in a field trial of PIRLS (2001), and since it was found to be a good measure for reading literacy it was again used for the purpose of our research. With the test we measured a child's ability to read and understand a text. The variable "points" were then used as one of the indicators of child's cognitive level.

7.3 Computer-assisted self-administered questionnaire

7.3.1 Design of the questionnaire

Since children are treated as a special population in survey research, a great deal of attention was paid to the design of the questionnaire, including the type of questions, length, structure, and the computer software used and usability features. In the beginning of the questionnaire, there were short instructions about how to complete it. On the first page, a pupil had to enter his/her ID number. Since our knowledge about a child's familiarity with the computer and his/her knowledge of using a computer mouse was poor, the first question in the questionnaire was: "How good are you in working with the computer mouse?" If a child answered that he/she is not familiar with working with computer mouse, instructions on how to use a mouse were shown on the screen. The questionnaire included some demographic questions (such as gender, date of birth), questions about school grades at mathematics, language and the general final grade. Then questions about everyday activities, reading and mathematics followed. The last part of the questionnaire was about computer use and the questionnaire itself.

The questions about reading, mathematics and daily activities were the same as those used in previous paper-and-pencil research (PIRLS 2001 and TIMSS 2003). The same questions were used with the intention to compare results from different questionnaire modes. Since there have been suggestions that each question should be presented in a conventional format similar to that normally used in self-administered paper questionnaires (Lozar Manfreda et al. 2002), we tried to follow that rule. Therefore, the form of questions was the same as in paper-and-pencil mode.

The questionnaire consisted of 11 pages. The questionnaire was designed in such a way that there was no need to scroll down the pages; only one page was intentionally longer, requiring children to scroll down, so that we could see how they managed the situation. All questions were in closed format, except for the question at the end of questionnaire, when they were asked to evaluate the time they had spent completing the questionnaire.

Since we were also interested in item non-response, if an item was left unanswered there were no reminders to complete the question. The process of completing the questionnaire was timed. We measured how much time a child spent per each page, the timing started when they entered the ID number and the first page was submitted.

Two different programs for computerized data collection had been tested before creating the questionnaire on the Internet. The program QML 2 WWW developed by CATI d.o.o. was chosen for the computerized questionnaire.

Movement through the computerized survey was designed to be as similar as possible to the paper form. To accomplish this, several key features were incorporated in the computerized version:

1. Scrolling – respondents were allowed unlimited scrolling to next and previous questions.
2. No automatic next – it was decided not to put an automatic jump to the next page or next question. A respondent had to click “next” (naprej) button to continue the survey once a response was selected.

3. No keyboard responses – with the exception of one open-ended question. (If respondents were to use numbers to select answers, this would have introduced a visual inconsistency with the paper version, where the answers had not been labeled.)
4. No reminders. Respondent was allowed to leave the question unanswered without reminders to answer it.
5. Correcting the response. A respondent was allowed to correct the given response.

7.4 Paper-and-pencil studies

7.4.1 PIRLS

To compare results form computer-assisted questionnaires, results of two surveys were used. One of the surveys was PIRLS 2001 in which Slovenia also participated. The study consisted of assessment tests and several different questionnaires – for pupils, their parents, teachers and school administrators. In Slovenia children in the third year of formal schooling participated in the study. 150 primary schools were enrolled in the study, with one class of pupils sampled per school. Altogether 3118 pupils participated in the survey. Data collection for Slovenia took place in April and May 2001. The sample was representative for Slovene schools.

Several items from the PIRLS questionnaire designed for pupils in lower grades of primary school were repeated in the computer-assisted self-administered questionnaire with the intention to compare results.

The repeated items:

Attitudes about reading:

I read only if I have to.

I think reading is boring.

I like talking about books.

I would be very glad to get a book as a present.

For my future it is very important to learn to read well.

I enjoy reading.

Attitudes were measured on an ordinal scale: agree a lot, agree a little, disagree a little and disagree a lot.

Reading ability:

I think reading is easy.

I don't read as good as my schoolmates.

I understand almost everything that I read myself.

Reading aloud is difficult for me.

The items were measured on the same scale as attitudes about reading.

The average age of children who participated in the PIRLS study was 9.8 (std. dev.=0.43). They were 51.1% girls and 49.9% boys.

7.4.2 TIMSS

The second paper-and-pencil study used to compare results was IEA's study TIMSS 2003 (Trends in International Mathematics and Science Study). The data collection for the study took place in April and May 2003. The study consisted of mathematics and science achievement tests, questionnaires for students, teachers and school principles. The population sampled were pupils of third and fourth grade, according to the school system (eight or nine years schooling) and pupils of seventh and ninth grade, according to the school system. 176 schools and classes participated in the study. Altogether 3126 pupils from lower primary school participated in the study.

For the purpose of comparison the following items were repeated in the computer-assisted self-administered questionnaire:

Attitudes towards mathematics:

I think math is more difficult for me than for my schoolmates.

I am just not good at mathematics.

I am usually good at mathematics.

I would like to have more mathematics at school.

I like learning mathematics.

I learn mathematics quickly.

Attitudes were measured on ordinal scale: agree a lot, agree a little, disagree a little and disagree a lot.

The second set of items was about activities outside school:

On an ordinary week, how much time would you say you spend to:

Watch TV or video.

Play computer games.

Play or talk with friends.

Do jobs at home.

Play sports.

Read book for enjoyment.

Use the Internet.

Items were measured on an ordinal scale:

No time; less then 1 hour; 1 to 2 hours; more than 2 but less then 4 hours; 4 or more hours.

The average age of respondents was 9.9 (std. dev.=0.35). There were 48.9% girls and 51.1 % boys enrolled in the study.

7.5 Results of the self-administered computer-assisted survey

As mentioned, 135 pupils from third and fourth grade participated in the study. Most of the pupils were born in 1994 (77.6%), 20.1% were born in 1995 and 2.2% in 1993. 67.9% of pupils from the survey were finishing the third grade and 32.1% were finishing the fourth grade. The average age of a respondent was 9.8 years (std. dev.=0.43).

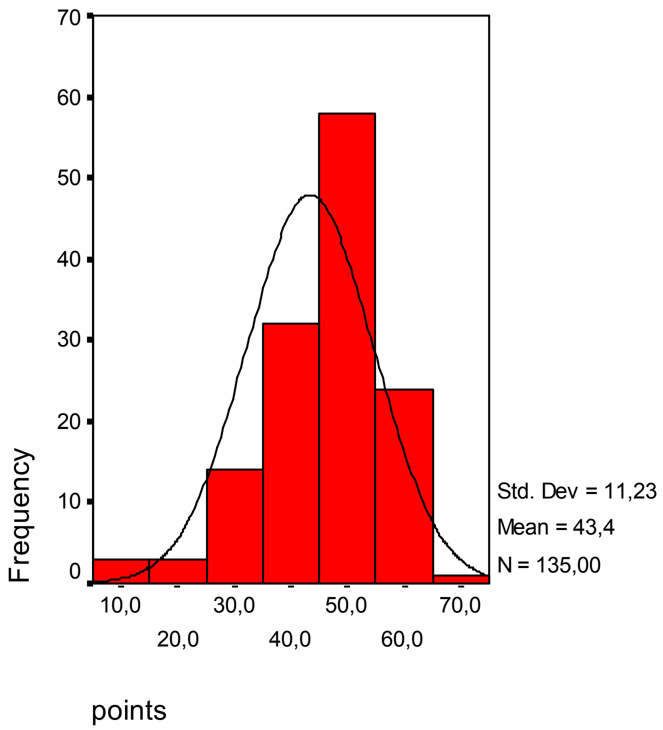
In the survey, 68 girls (51.9%) participated and 63 boys (48.1%), for four respondents the gender was not recorded (skipped question).

For the purpose of the study, an index of cognitive level was constructed. The index was constructed on the basis of four variables: points achieved on the reading literacy test, self-predicted final grade in mathematics, self-predicted final grade in Slovenian language and self-predicted final overall grade (which is a grade from all subjects altogether).

7.5.1 Results for reading literacy test

The average number of points achieved on the reading literacy test was 43.37. The minimum number of points was 5 and the maximum number was 65.

Picture 7.1: Number of points achieved on reading literacy test



Since the theory and empirical result show that boys perform lower than girls in reading (Cohen 2002, Mullis et al. 2001), we tested the results for boys and girls.

Table 7.1: Mean number of points according to sex

		Points			
		Mean	Max	Min	Std. Dev.
gender	girl	44.85	65.00	15.00	10.58
	boy	42.38	60.00	5.00	11.77

Girls achieved a better mean score on the reading literacy test, but the difference between the two groups was not significant (F=1.602, df=1; p=0.208). There is also no significant difference in mean score according to the grade: mean score in the third grade was 43.6 and in fourth grade, the mean score was 43.1. (F=0.30, df=1, p=0.862)

Correlation between points achieved in the reading literacy test and the self-predicted final grade in Slovenian language was relatively low (r=0.197) but significant at the 0.05 level, there was no correlation between score and self-predicted final grade in mathematics, and quite low correlation between score and final overall grade (r=0.272, significant at 0.01

level). We found those results quite surprising. Therefore, we examined correlations between score and school grade according to years of schooling.

Table 7.2: Correlations between points on reading literacy test and predicted grades in the third grade of 8 year system

		points	Final grade in Slovenian language	Final grade in mathematics	Final overall grade
Points	Pearson Correlation	1	.175	-.034	.248(*)
	Sig. (2-tailed)	.	.096	.798	.019
	N	91	91	58	90
Final grade in Slovenian language	Pearson Correlation	.175	1	.476(**)	.721(**)
	Sig. (2-tailed)	.096	.	.000	.000
	N	91	91	58	90
Final grade in mathematics	Pearson Correlation	-.034	.476(**)	1	.561(**)
	Sig. (2-tailed)	.798	.000	.	.000
	N	58	58	58	58
Final overall grade	Pearson Correlation	.248(*)	.721(**)	.561(**)	1
	Sig. (2-tailed)	.019	.000	.000	.
	N	90	90	58	90

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

As seen from Table 7-2, in the third grade there is no statistically significant correlation between points achieved on reading literacy test and predicted final grade in Slovenian language and mathematics, although we would expect those two variables to correlate. There is a significant correlation between points achieved in reading literacy test and the final overall grade (0.248). This correlation is significant at the 0.05 level. We find higher correlations between final grade in Slovenian language and mathematics (0.476), final grade in Slovenian language and final grade (0.721) and final grade in mathematics and final overall grade (0.561). Those correlations are significant at 0.01 level.

Table 7.3: Correlations between points on reading literacy test and predicted grades in the fourth grade of nine year system

		points	Final grade in Slovenian language	Final grade in mathematics	Final overall grade
Points	Pearson Correlation	1	.309(*)	.367(*)	.364(*)
	Sig. (2-tailed)	.	.047	.030	.016
	N	43	42	35	43
Final grade in Slovenian language	Pearson Correlation	.309(*)	1	.639(**)	.737(**)
	Sig. (2-tailed)	.047	.	.000	.000
	N	42	42	34	42
Final grade in mathematics	Pearson Correlation	.367(*)	.639(**)	1	.727(**)
	Sig. (2-tailed)	.030	.000	.	.000
	N	35	34	35	35
Final overall grade	Pearson Correlation	.364(*)	.737(**)	.727(**)	1
	Sig. (2-tailed)	.016	.000	.000	.
	N	43	42	35	43

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

In the fourth grade we see (Table 7-3) that there are statistically significant correlations between points achieved on the reading literacy test and the self-predicted final grades in Slovenian language and mathematics and the general grade at the end of the school. Correlations are significant at the 0.05 level and are between 0.309 and 0.367. Correlations between predicted grades are higher (between 0.639 and 0.737) and significant at 0.01 level.

7.5.2 Index of cognitive level

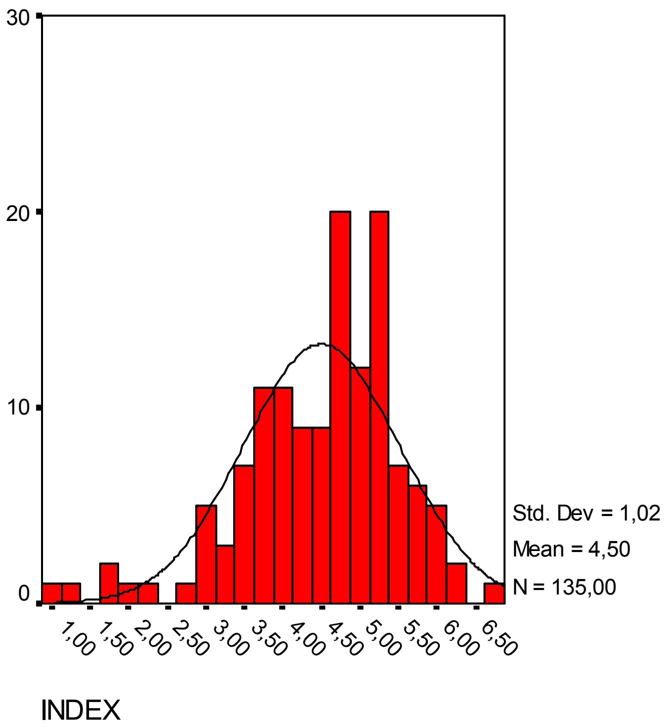
For further analysis an index of cognitive level was computed. In previous research (e.g., Borgers et al. 2003, Borgers et al. 2004, Fuchs 2002) the gender of a respondent and years of schooling were used as proxy indicators of child's cognitive level. Since the population in our study was children from third and fourth grade only, with little age difference, age and years of schooling were not appropriate variables to use for computing the index of cognitive level. Since we believe our study scores on the reading literacy test and grades are better indicators of cognitive level, we used those to compute an index of cognitive level. Variables used to compute an index were: points achieved on reading literacy test, final grade in Slovenian language, final grade in mathematics and final overall grade.

Table 7.4: Descriptives for index of cognitive level

			Statistic	Std. Error
INDEX of cognitive level	Mean		4.4993	.08740
	95% Confidence Interval for Mean	Lower Bound	4.3264	
		Upper Bound	4.6722	
	5% Trimmed Mean		4.5590	
	Median		4.6667	
	Variance		1.031	
	Std. Deviation		1.01554	
	Minimum		.91	
	Maximum		6.64	
	Range		5.73	
	Interquartile Range		1.2576	
	Skewness		-.909	.209
	Kurtosis		1.293	.414

The mean value of index of cognitive development is 4.5, minimum value is below 1 and maximum value is 6.6 (std. dev.=1.01). We use graphical presentation (histogram with normal curve) and the Klomogorov-Smirnov statistic to check for normality of the data.

Picture7.2: Histogram for index of cognitive level



The histogram (Picture 7-2) shows that data is not distributed normally therefore, we use M-Estimators for measures of central tendency. M-Estimators are robust measures of central tendency that can be used as alternatives to the mean and median. They are called robust because they are not sensitive to departures from normality. When the data have extreme values, M-Estimators provide better estimates of central tendency than do the mean or median.

Table 7.5: M-Estimators

	Huber's M-Estimator (a)	Tukey's Biweight (b)	Hampel's M-Estimator (c)	Andrews' Wave (d)
INDEX	4.6044	4.6637	4.6065	4.6642

a The weighting constant is 1.339.
b The weighting constant is 4.685.
c The weighting constants are 1.700, 3.400, and 8.500
d The weighting constant is 1.340*pi.

We see that M-Estimators differ from the mean value of the index, but are very similar to median. The construction of groups of respondents according to their cognitive level for further analysis was based on the value 4.6.

Gender of a respondent and index of cognitive level

According to the literature girls develop quicker than boys, especially in language skills. (Cherry et al. 1978 in Borgers, 2000, Coehn 2002). When comparing mean index of cognitive development between girls and boys, we see that the index for girls is somewhat higher, but from the further analysis we see it does not differ significantly.

Table 7.6: Index of cognitive level according to gender

gender	Mean	N	Std. Deviation
girl	4.63	68	.99274
boy	4.40	63	1.03438
Total	4.52	131	1.01573

To test the hypothesis that two means are equal, we used analyses of variance – One way ANOVA. The One-Way ANOVA procedure produces a one-way analysis of variance for a quantitative dependent variable by a single factor (independent) variable. Analysis of variance is robust to departures from normality, although the data should be symmetric. The groups should come from populations with equal variances. To test this assumption, we used Levene's homogeneity-of-variance test.

Test of Homogeneity of Variances

Table 7.7: Test of Homogeneity of variances for index of cognitive level

Levene Statistic	df1	df2	Sig.
.008	1	129	.927

The significance value exceeds .05, suggesting that the variances for two groups are equal and the assumption is justified.

Table 7.8: ANOVA for Index of cognitive level

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.756	1	1.756	1.711	.193
Within Groups	132.367	129	1.026		
Total	134.122	130			

As seen from Table 7-8, the difference between two groups (boys and girls) is not statistically significant (F=1.711, df=1, p=0.193).

Due to small age differences, we also do not expect significant difference of index of cognitive development according to the age of pupil. For this analysis we split pupils into three equally sized groups, in the first group are the youngest respondents whose mean age is 9.3, the second group consists of pupils whose mean age is 9.9 and in the third group are pupils whose mean age is 10.2.

Table 7.9: Age and mean index of cognitive level

age	Mean index	N	Std. Deviation	Minimum	Maximum	% of Total Sum
8.6 to 9.7 years	4.57	48	1.02538	1.83	6.64	36.7%
9.7 to 10 years	4.49	45	.96012	1.36	6.00	33.7%
10.1 to 10.8 years	4.43	40	1.09279	.91	6.18	29.6%
Total	4.50	133	1.01882	.91	6.64	100.0%

Table 7-9 shows that the mean index of cognitive level is the highest in the group of the youngest respondents and the lowest in the group of the oldest respondents. Although there are differences between the groups, they are not statistically significant (F=0.222, df=2, p=0.801). The results show that in our study, age would not be a good measure of cognitive level and the decision not to take age as a proxy indicator of a cognitive level in the study is supported by the results.

For the purpose of further analysis we computed an index of cognitive level. As told before, the index was computed on the basis of four variables: points achieved on the reading literacy test, self-predicted final grade in Slovenian language, self-predicted final grade in mathematics and self-predicted final overall grade.

Table 7.10: Categories of index of cognitive level (CSAQ)

INDEX of cognitive level	Mean	Max	Min	Std Dev.	Variance	Std Error of Mean	N	Col Valid N %
Below average	3.36	4.17	.91	.78	.61	.12	45	33.3%
Average	4.68	5.08	4.18	.26	.07	.04	48	35.6%
Above average	5.51	6.64	5.09	.37	.14	.06	42	31.1%

An index of cognitive level was computed, consisting of three categories: (1) respondents whose mean index was below average: 3.36, (2) respondents with the average mean index: 4.68, and (3) respondents with the mean index above the average: 5.51.

7.5.3 Influence of questionnaire mode and child characteristics on data quality

To measure and compare data quality in the paper-and-pencil questionnaire and the computer-assisted questionnaire, several statistical analyses were used. First the responses for the two questionnaire modes were compared, using chi-square statistics to test whether mode effect exists. For further analyses, two data quality indicators were used. As the first indicator, a measure of reliability, internal consistency on reading and mathematics attitude scale (Cronbach's alpha) was used. The second indicator was item non-response on attitudes about reading and mathematics, with comparison to PAPI mode. As the third measure, item non-response on the computer-assisted questionnaire was used.

In this part of the analysis, we compare paper-and-pencil mode to computer-assisted mode. For the analyses, variables measuring attitudes towards reading and variables measuring attitudes towards mathematics were used.

7.5.3.1 Chi-square tests

For the first comparisons between the two modes we do not use child characteristics, as the intention is to see whether comparable results are obtained by different questionnaire modes.
It might be expected that answers obtained by computer-assisted questionnaire would differ substantially from those obtained by paper-and-pencil questionnaire, if the mode effect exists.
For the analyses, twelve items which were measured on an ordinal scale (attitudes towards reading and mathematics) from PIRLS and TIMSS questionnaire were used.
As presented in Table 7-11 the difference in the responses obtained with two different modes of data collection is for most items very low, some of the frequency distributions are even surprisingly similar. For three items we find that the difference between two modes is statistically significant. As mentioned earlier, the questionnaires were not identical, when children were involved in the TIMSS and PIRLS studies they were also completing tests from mathematics and science (TIMSS) and reading (PIRLS), which could have influenced their answers.

Table 7.11: Attitudes towards reading – chi square

	PAPER		CASQ				
	n	%	n	%	x2	df	p
I read only if I have to.							
agree a lot	971	34.60	40	33.1			
agree a little	347	12.36	19	15.7			
disagree a little	587	20.91	26	21.49			
disagree a lot	902	32.13	36	29.75	1.338	3	0.720
I like talking about books.							
agree a lot	1058	37.7	44	36.4			
agree a little	948	33.8	41	33.9			
disagree a little	415	14.8	17	14.0			
disagree a lot	386	13.8	19	15.7	0.405	3	0.939
I think reading is boring.							
agree a lot	1888	67,3	78	64,5			
agree a little	103	10,8	17	14.0			
disagree a little	290	10.3	12	9.9			
disagree a lot	326	11.6	14	11.6	1,279	3	0.734
I would be very glad to get book as a present.							
agree a lot	1953	69.6	73	60.3			
agree a little	528	18.8	31	25.6			
disagree a little	176	6.3	13	10.7			
disagree a lot	150	5.3	4	3.3	8.763	3	0.033
For my future it is very important to learn to read well.							
agree a lot	2491	88.7	98	81.0			
agree a little	207	7.4	12	9.9			
disagree a little	47	1.7	4	3.3			
disagree a lot	62	2.2	7	5.8	7.680	3	0.053
I enjoy reading.							
agree a lot	1753	62.5	66	54.5			
agree a little	654	23.3	34	28.1			
disagree a little	173	6.2	10	8.3			
disagree a lot	227	8.1	11	9.1	3.174	3	0.366

Table 7.12: Attitudes towards mathematics – chi square

	PAPER		CASQ				
	n	%	n	%	x2	df	p
I am usually good at mathematics.							
agree a lot	1501	52.9	88	67.7			
agree a little	1059	37.3	23	17.7			
disagree a little	180	6.3	8	6.2			
disagree a lot	99	3.5	11	8.5	26.528	3	0.000
I am just not good at mathematics.							
agree a lot	1691	59.56	82	65.1			
agree a little	634	22.3	22	17.5			
disagree a little	302	10.6	13	10.3			
disagree a lot	212	7.5	9	7.1	1.937	3	0.586
I think math is more difficult for me than for my schoolmates.							
agree a lot	1342	47.3	71	54.2			
agree a little	794	28	26	19.8			
disagree a little	383	13.5	18	13.7			
disagree a lot	320	11.3	16	12.2	4.358	3	0.225
I would like to have more mathematics at school.							
agree a lot	1068	36.6	47	36.2			
agree a little	668	23.4	33	25.4			
disagree a little	503	17.7	25	19.2			
disagree a lot	604	21.3	25	19.2	0.687	3	0.876
I like learning mathematics.							
agree a lot	1424	50.2	56	42.7			
agree a little	777	27.4	51	38.9			
disagree a little	290	10.2	14	10.7			
disagree a lot	348	12.3	10	7.6	9.634	3	0.022
I learn mathematics quickly.							
agree a lot	1661	58.5	80	60.6			
agree a little	873	30.8	39	29.5			
disagree a little	217	7.6	9	6.8			
disagree a lot	88	3.1	4	3.0	0.269	3	0.966

7.5.4 Internal consistency

The internal consistency method is probably the method which is the easiest to conduct when we want to estimate the reliability of measuring. It is based on the computation of covariances or correlation coefficients between all the variables measuring the same latent variable (Ferligoj 1995). Internal consistency reliability is concerned with the homogeneity of the items comprising a scale. If the items of a scale have a strong relationship to their latent variable, they will have a strong relationship to each other. A scale is internally consistent to the extent that its items are highly intercorrelated. High inter-item correlations suggest that the items all measure the same thing. Internal consistency is equated with Cronbach's coefficient alpha (α). Alpha is defined as the proportion of a scales total variance that is attributable to a common source, presumably the true score of a latent variable underlying the items (DeVellis 1991).

The range of possible values for coefficient alpha (α) is between 0.0 and 1.0.

The expression: (DeVellis 1991: 30)

$$\alpha=\left(\frac{N}{N-1}\right)\left(1-\frac{\sum^{N}_{i=1}\delta^2 X_i}{\delta^2 X}\right)$$

Values of α (Ferligoj 1995):

$\alpha \geq 0.80$	reliability of measured variables is excellent
$0.70 \leq \alpha < 0.80$	reliability of measured variables is very good
$0.60 \leq \alpha < 0.70$	reliability of measured variables is sufficient
$\alpha < 0.60$	reliability of measured variables is hardly acceptable

7.5.4.1 Reliability analysis - attitudes towards reading

By attitudes towards reading two constructs were measured:

- Must read, **must_r**, which is measured by two variables ("I read only if I have to." (A_MUST), "I think reading is boring." (A_BORI)).

- Enjoy reading, **enjoy_r**, which is measured by four variables ("I like talking about books." (A_TALK), "I would be very glad to get book as a present." (A_PRES), "For my future it is very important to learn to read well."(A_FUTR), "I enjoy reading." A_ENJOY)).

All the attitudes were measured on an ordinal scale. For analyses of internal consistency, all variables should be numerical, therefore for the purpose of analyses, the scale was taken as a numerical one: Agree a lot = 4, Agree a little = 3, Disagree a little = 2, Disagree a lot = 1.

Table 7.13: Mean values of reading attitudes according to data collection mode

MODE		A_MUST	A_TALK	A_PRES	A_BORI	A_FUTR	A_ENJOY
PAPER	Mean	2.51	2.95	3.52	1.67	3.82	3.39
	N	2916	2916	2886	2872	2924	2928
	Std. Dev.	1.25736	1.03454	.84186	1.06642	.56986	.92634
CSAQ	Mean	2.49	2.91	3.41	1.69	3.67	3.27
	N	130	128	126	128	129	128
	Std. Dev.	1.25288	1.05014	.83206	1.06156	.79386	.96158
Total	Mean	2.51	2.95	3.51	1.67	3.81	3.39
	N	3046	3044	3012	3000	3053	3056
	Std. Dev.	1.25697	1.03506	.84158	1.06604	.58170	.92798

In Table 7-13 mean values of attitude statements are presented for both modes. As seen, the differences in mean values and standard deviations are small (and also insignificant) with one exception – respondents in PAPI mode agreed more with the statement "Reading is important for my future" (3.8) than respondents in CSAQ mode (p=0.04). One possible explanation for this result could also be the research situation. Respondents in PAPI mode also completed reading literacy test, but the conditions were to some extent different – they were timed, they had to read more texts and they felt more under pressure. They knew they were participating in a reading literacy study, while in CSAQ mode they were aware that the purpose of the research was different.

The reliability of the two subscales in both instruments was compared. The results are presented in the Table 7-14.

Table 7.14: Values of Cronbach's alpha for two constructs in two modes of data collection

	CSAQ	PAPER	p value difference
Must read, must_r	0.4205	0.4710	p>0.05
Enjoy reading, enjoy_r	0.7758	0.6939	p=0.033

Table 7-14 shows some interesting results – the construct "Must read" has quite low coefficient **α** in both modes. (The reason for that could be the number of items measuring latent variable. **Must_r** is measured only by two variables, while **enjoy_r** is measured by four variables.) On the other hand the construct "Enjoy reading" has much higher coefficient α in CSAQ mode compared to paper questionnaires (0.77 vs. 0.69). With the Alfatest program (Hox 1991) the difference between two modes was computed. Alfatest is a computer program which computes the difference between two or more values of Cronbach Alpha and enables computing p values for samples of different size. The program performs significance tests for independent alpha coefficients, for up to 20 groups. First a global test is preformed, this is followed by pairwise comparisons between all pairs of alphas.

The table shows that the difference for coefficient α is statistically significant for construct "Enjoy reading". The first results show that computer assisted mode is not less reliable compared to paper-and-pencil mode.

Reliability analysis was also done to compare girls and boys for both methods of data collection. In the computerized questionnaire, the difference between boys and girls is high on the construct "Enjoy reading". But as seen from the table the difference is not statistically significant. The table also shows that both boys and girls gave more reliable answers in the computer-assisted mode.

Table 7.15: Values of Cronbach's alpha for two constructs in two modes of data collection according to gender

	CSAQ			PAPER		
	Girls	Boys	p	Girls	Boys	p
Must_r	0.5089	0.3473	p>0.05	0.4714	0.4264	p>0.05
Enjoy_r	0.7122	0.8231	p>0.05	0.6521	0.6940	p>0.05

In neither CSAQ nor in paper-and-pencil mode is the difference between two groups significant (p>0.05). The Table 7-15 also shows that in both modes coefficient α was higher for the construct **enjoy_r**. The statistical significance between both modes according to gender was also tested.

The difference in reliability between two modes was statistically significant for the construct **enjoy_r** only in the group of boys. Boys gave statistically significant more reliable results in computer assisted mode ($p<0.05$).

Comparing CSAQ and paper-and-pencil mode according to the gender, showed that for both groups and both constructs, CSAQ provided more reliable results, although the difference was statistically significant for just one construct in the group of boys.

7.5.4.1.1 Reliability analysis according to index of cognitive level

Since one of our research questions is whether cognitive level influences reliability of responses in computer-assisted mode, we also compared three groups of respondents according to their index of cognitive level. For the construct "Enjoy reading", there are no statistically significant differences between the three groups. But for the second construct "Must read" we find large differences between groups (Table 7-16).

Table 7.16: Values of Cronbach's alpha for two constructs in CSAQ according to index of cognitive level

	below average	average	above average	p value differences
	α	α	α	g1-g2: p>0.05
Enjoy reading.	0.7788	0.7760	0.7834	g1-g3: p>0.05
				g2-g3: p>0.05
Must read.	-0.6409	0.5604	0.6603	g1-g3: p=0.03
				g1-g3: p=0.01
				g2-g3: p>0.05
				(overall p=0.04)

The results (Table 7-16) show no difference for the first construct according to the index of cognitive level. The reliability of responses was the same in all three groups. Results for the second construct are quite surprising. The alpha score for respondents who are in the group of children with a below average cognitive index is negative, which can occur when items are negatively correlated (DeVellis 1991). Since Cronbach's alpha are positive for the other two groups of respondents, we suspect that the cause for this result is not the mode of a questionnaire, but the construct – it is possible that structure (variables which measure the construct) of the construct is different for different groups of respondents.

We also compared groups of respondents according to their cognitive level for paper-and-pencil mode.

We used PIRLS questionnaire to compute the index of cognitive development for respondents who answered the paper-and-pencil questionnaire. Since the questionnaire was developed for a different purpose, it contained different variables. In the PIRLS questionnaire children also first read the story and answered test questions, but scoring of the test was different. Therefore values of an index are different (higher). In the questionnaire there were also questions about the final grade in Slovenian language and the final overall grade, but there was no question about the final grade in mathematics. To compute an index of cognitive development we used a variable which contained an average score on the test, the final grade in Slovenian language and the final overall grade. The index was categorized into three categories.

Table 7.17: Categories of index of cognitive level (PAPER)

Index of cognitive level	Mean	Max	Min	Std Deviation	Standard Error of Mean	Valid N	Col Valid N %
Below average	44.49	51.49	1,00	13.60	.42	N=1025	33.3%
Average	52.95	54.41	51.49	.82	.03	N=1026	33.3%
Above average	64.21	169.16	54.41	26,11	.81	N=1026	33.3%

The first group contains respondents whose index of cognitive development is below mean index value, group 2 contains respondents whose index of cognitive development is average, and group 3 includes respondents whose index of cognitive development is above mean index value.

Table 7.18: Values of Cronbach's alpha for two constructs in paper mode q. according to index of cognitive level

	below average α	average α	above average α	p value differences
Enjoy reading	0.6922	0.6800	0.6989	g1-g2: p>0.05
				g1-g3: p>0.05
				g2-g3: p>0.05
Must read	0.3187	0.3657	0.5257	g1-g2: p=0.00
				g1-g3: p=0.00
				g2-g3: p=0.01
				(overall p=0.00)

In the paper mode we see (Table 7-18) a similar pattern as in CSAQ mode. Testing the first construct "Enjoy reading" shows that there is no statistically significant difference between the three groups. The second construct "Must read" again turns out to be a very unreliable measure for the group of respondents with a below average or an average index of cognitive skills. It is also very low for the group of respondents with an above average index of cognitive skills, which again leads us to the thought that manifest variables do not measure the construct well enough.

The results show that Cronbach's alpha is lower for both constructs and all three groups in paper-and-pencil mode, except for the "Must read" construct in group 1 (below average).

The tests for statistical significance between two modes were done for the group of respondents whose index of cognitive skills is above average. The groups do not significantly differ at construct "Enjoy reading." ($p>0.05$), but they do differ at the second construct ($p<0.05$).

We were also interested if respondents differ in reliability of their responses according to how often they use a computer. Variables used to compute an index of computer use were:

1) How often do you use a computer: at home; at school; at friends; at other places; and 2) How often do you: play computer games; write stories and reports on computer; use computer to find information on the Internet; send or read e-mail.

The index was divided into two categories – "often use of computers" and "rare use of computers". We compared the reliability of responses according to the frequency of use of computers and found surprising results: respondents who use computers rarely gave more reliable responses for both constructs then respondents who use computers often.

Table 7.19: Values of Cronbach's alpha for two constructs in CSAQ according use of computers

	often use of computers α	rare use of computers α	p value differences
Enjoy reading	0.7463	0.8138	g1-g2: p>0.05
Must read	0.3981	0.3767	g1-g2: p>0.05

Although there are some differences between groups, Alfatest shows that the differences are not statistically significant. The results show that reliability of responses is not influenced by the respondent's experience with computers.

7.5.4.2 Structural equation modeling – attitudes towards reading

In the second part a test was made to confirm that the two questionnaire modes measure the same constructs on the same scales. In this part of the study the measurement of structural equivalence was tested across two instruments – PAPI in CSAQ. Again attitudes about reading were used for the analysis. Structural equation modeling was used to test the measurement and structural equivalence.

In the first part, the analysis was done on a merged database (database consisting of both instruments). To test the factorial equivalence between both instruments, several confirmatory factor analyses were performed. The programs LISREL and STREAMS were used for the analyses.

Six manifest variables (attitudes about reading) measure two constructs (latent variables):

The first construct is named: **must_r** (Must read.) and is measured by two manifest variables:

AS_MUST (I read only if I have to);

AS_BORI (I think reading is boring);

The second construct is named: **enjoy_r** (Enjoy reading.) and is measured by four manifest variables:

AS_TALK (I like talking about books.);

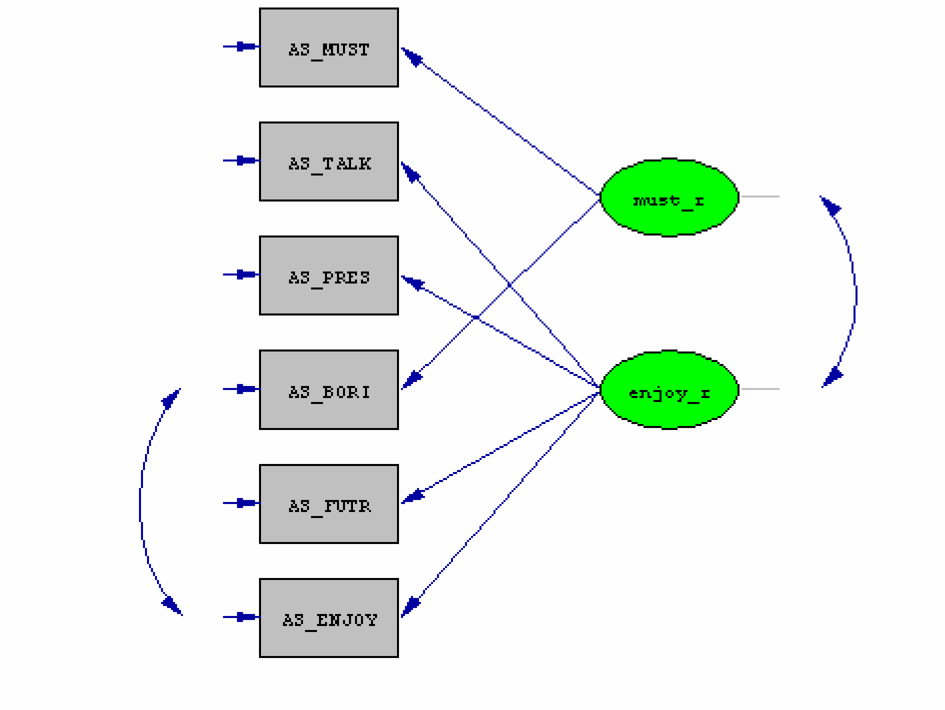
AS_PRES (I would be very glad to get book as a present.);

AS_FUTR (For my future it is very important to learn to read well.);

AS_ENJOY (I enjoy reading.).

The two constructs are correlated.

Picture 7.3: Conceptual model - attitudes towards reading



First the fit for the total set of a data was computed:

Chi-Square=64.334, df=7, P-value=0.000, RMSEA=0.053.

The results show not a very good, but acceptable fit of the data.

In the next model, where two separate groups were analysed we first used constraints over groups, which means that every parameter is constrained to be equal over every group of cases. A more highly constrained model is easier to estimate (Gustafsson, Stahl 2000).

Fit for the two group model with constraints:

Chi-Square=129.320, df=34, P-value=0.000, RMSEA=0.051.

The result indicates there could be differences between two modes, with respect to one or more parameters of the oblique two factor model. The differences could pertain to one or more of the different parameters of the model such as means of latent variables, intercepts of the manifest variables, variances of the manifest variables, residual variances of the manifest variables and (or) covariances among latent variables. In order to clarify in what respect the models for two different modes of data collection differ, it is necessary to investigate models which impose fewer constraints.

In the second two-group model, every parameter was free over groups.

Fit for the two group model with no constraints:

Chi-Square=66.993, df=14, P-value=0.000, RMSEA=0.051.

For the first model (parameters fixed over groups) RMSEA indicates that the fit is still acceptable and model with every parameter free over groups gives similar results. The program itself indicates there are some differences between two modes, but the difference test (χ^2*diff*=63.227, df=20) shows the difference is not statistically significant. (Because the critical value for χ^2 with 1 degree of freedom is 3.84, and the obtained value is less than the critical value, we conclude that there is no significant difference between the two models (Kelloway 1998).)

We conclude that the same scales in different instruments measure the same latent variables.

Table 7.20: Relations (correlations) in fully constrained model

	must_r		enjoy_r	
Relation	CSAQ	PAPER	CSAQ	PAPER
AS_MUST	.35	.35		
AS_TALK			.61	.61
AS_PRES			.65	.65
AS_BORI	.83	.83		
AS_FUTR			.42	.42
AS_ENJOY			.76	.76

Table 7-20 shows correlations between manifest and latent variables in computer-assisted and paper-and-pencil mode. Since the model is fully constrained, correlations for both modes are the same.

In Table 7-21 correlations between manifest and latent variables are shown for both modes of data collection. As shown, correlations for the model where every parameter is free over groups differ for the two modes. The biggest difference between modes is found in correlation between latent variable “must_r” and manifest variable “AS_BORI” (CASQ r=0.56 vs. PAPER r=0.84).

Table 7.21: Relations (correlations) in every parameter free over groups

	must_r		enjoy_r	
Relation	CASQ	PAPER	CASQ	PAPER
AS_MUST	.32	.35		
AS_TALK			.63	.61
AS_PRES			.79	.65
AS_BORI	.56	.84		
AS_FUTR			.56	.41
AS_ENJOY			.81	.76

7.5.4.3 Reliability analyses - attitudes towards mathematics

We analysed variables measuring attitudes towards mathematics similarly as in our analysis of internal consistency for variables measuring attitudes towards reading.

Two constructs were tested:

- Mathematics is difficult, **Difficult_m**. The construct was measured by two variables: "I think math is more difficult for me than for my schoolmates." (AS_HARD) and "I am just not good at mathematics." (AS_GOOD).
- Enjoy mathematics, **Enjoy_m**. The construct was measured by four variables: "I am usually good at mathematics." (AS_WELL); "I would like to have more mathematics at school." (AS_MORE); "I like learning mathematics." (AS_ENJO); and "I learn mathematics quick." (AS_QUIC).

All the attitudes were measured on an ordinal scale. For analyses of internal consistency, all variables should be numerical, therefore for the purpose of analyses the scale was taken as a numerical one, higher value means higher agreement: Disagree a lot=1; Disagree a little=2; Agree a little=3; Agree a lot=4.

Table 7.22: Mean values of mathematics attitudes according to questionnaire mode

MODE		AS_WELL	AS_MORE	AS_HARD	AS_ENJO	AS_GOOD	AS_QUIC
PAPER	Mean	3.39	2.77	1.88	3.15	1.66	3.44
	N	2839	2839	2839	2839	2839	2839
	Std. Dev.	.75850	1.16342	1.02285	1.03471	.94100	.76564
CSAQ	Mean	3.44	2.78	1.84	3.17	1.59	3.48
	N	130	130	131	131	126	132
	Std. Dev.	.94057	1.13428	1.07286	.90429	.93960	.75631
Total	Mean	3.39	2.77	1.88	3.15	1.66	3.45
	N	2969	2969	2970	2970	2965	2971
	Std. Dev.	.76726	1.16198	1.02496	1.02917	.94087	.76513

As the Table 7-22 shows, the differences in mean values as well in standard deviations between the two modes tend to be very small, despite the big difference in sample size. There is no statistical difference between attitudes according to the mode of data collection.

Table 7.23: Values of Cronbach's alpha for two constructs in two modes of data collection

	CSAQ	PAPER	p value difference
Difficult_m	0.6723	0.6666	p>0.05
Enjoy_m	0.5616	0.6582	p>0.05

In computer-assisted mode the coefficient α is sufficient but not very good (Ferligoj 1995) for the construct “Math is difficult” and hardly acceptable for the construct “Enjoy mathematics”. In paper-and-pencil mode the value of α is sufficient for both constructs. Despite the different values of coefficient α, Alfatest shows that the difference between two modes is not statistically significant. We can say that although the values of Cronbach’s α are relatively low for both modes, the reliability of responses is not affected by the mode.

In the next step we compared reliability of responses between girls and boys in both modes.

Table 7.24: Values of Cronbach's alpha for two constructs in two modes of data collection according to sex

	CSAQ			PAPER		
	Girls	Boys	p	Girls	Boys	p
Difficult_m	0.7554	0.5279	$p<0.05$	0.6768	0.6489	$p>0.05$
Enjoy_m	0.6119	0.4141	$p<0.05$	0.6752	0.6444	$p>0.05$

Table 7-24 shows that in CSAQ mode for both constructs, boys gave much less reliable responses compared to girls. Although the difference between boys and girls for the first construct (Mathematics is difficult.) is 0.18, with Alfatest we show that the difference between groups is not statistically significant.

In paper-and-pencil mode boys also gave slightly less reliable responses compared to girls, but the difference in reliability of answers between girls and boys is not statistically significant.

Internal consistency of constructs regarding mathematics according to index of cognitive level of respondent was not tested in paper-and-pencil mode, due to lack of variables which would enable us to compute an index of cognitive level in paper-and-pencil mode. Therefore tests were performed only for computer-assisted mode.

Table 7.25: Values of Cronbach's alpha for two constructs in CSAQ according to index of cognitive level

	below average α	average α	above average α	p value differences
Mathematics is difficult.	0.6424	0.6628	0.7207	g1-g2: $p>0.05$
				g1-g3: $p>0.05$
				g2-g3: $p>0.05$
Enjoy mathematics.	0.6782	0.7478	0.7256	g1-g2: $p>0.05$
				g1-g2: $p>0.05$
				g1-g2: $p>0.05$

Similarly as in reliability analysis of attitudes towards reading, the results show that cognitive level does not have any influence on reliability of answers in computer-assisted mode.

The results support our hypothesis that computer-assisted mode is not less reliable than paper-and-pencil mode.

Again we tested how the respondents answered, according to how often they use computers.

Table 7.26: Values of Cronbach's alpha for two constructs in CSAQ according to use of computers

	Often use of computers α	Rare use of computers α	p value differences
Difficult_m	0.6196	0.7272	g1-g2: p>0.05
Enjoy_m	0.4684	0.6470	g1-g2: p>0.05

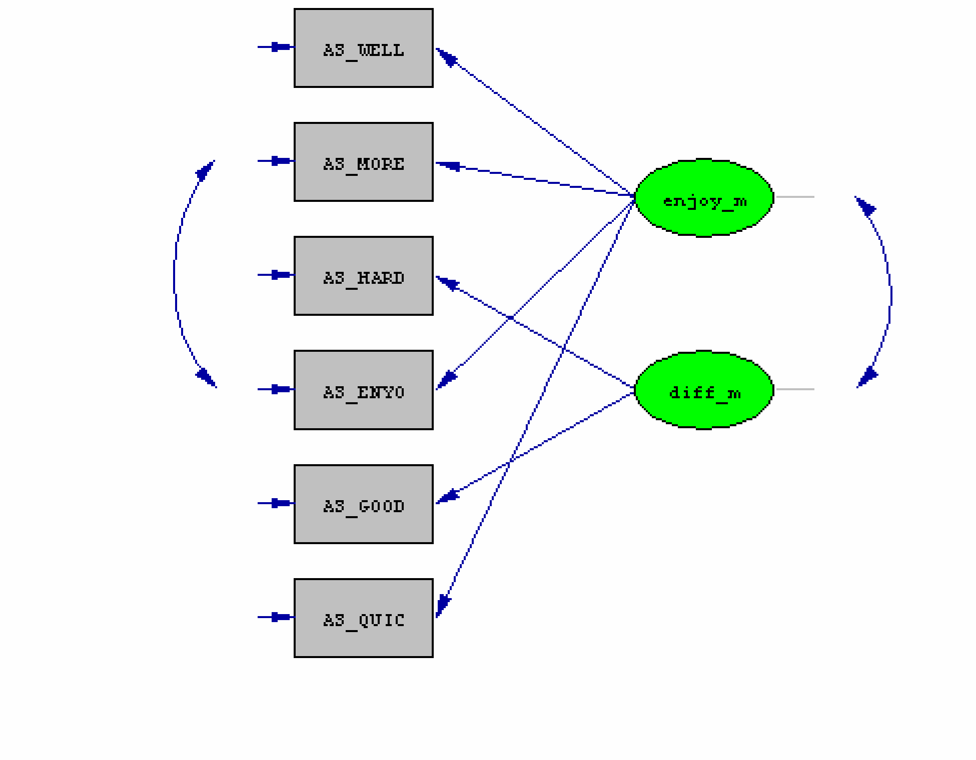
The results of the internal consistency test are similar to the results of our tests of attitudes towards reading. The Cronbach Alpha is again higher for the group of respondents who do not use computers very often in both constructs. Although there are big differences between groups, Alfatest showed the differences are not statistically significant ($p>0.05$).

7.5.4.4 Structural equation modeling – attitudes towards mathematics

Again further analyses were performed – the two modes should measure the same constructs on the same scales. In this part of the study the measurement of structural equivalence was tested across two instruments – paper questionnaire in CSAQ. Structural equation modeling was used to test the measurement and structural equivalence.

In the first part the analysis was done on merged database (database consisting of both instruments). To test the factorial equivalence between both instruments, several confirmatory factor analyses were performed. Programs LISREL and STREAMS were used for the analysis.

Picture 7.4: Conceptual model – attitudes towards mathematics



Six manifest variables (attitudes about mathematics) measure two correlated constructs (latent variables):

The first construct is named: **diff_m** (Mathematics is difficult.) and is explained by: "I think math is more difficult for me than for my schoolmates." (AS_HARD) and "I am just not good at mathematics." (AS_GOOD).

The second construct is named: **enjoy_m** (Enjoy mathematics.) and is explained by the following four variables: "I am usually good at mathematics." (AS_WELL); "I would like to have more mathematics at school." (AS_MORE); "I like learning mathematics." (AS_ENJO); and "I learn mathematics quick." (AS_QUIC).

Fit of the base model (merged database): Chi-square= 29,650 df=7 p=0.000 RMSEA=0.033. Although p value is low, other indicators show a reasonably good fit for the merged database.

The constrained two group model still has a very good fit (Chi-square=73.803, df=34, p=0.000, RMSEA=0.031). Nevertheless we test the model with no constraints over groups: Chi-square= 38,883 df=14 p=0.000 RMSEA=0.035. The fit is still good and the difference test (χ^2*diff*= 34.92, df=20) shows the difference is not statistically significant.

Table 7.27: Relations (correlations) in fully constrained model

	diff_m		enjoy_m	
Relation	PAPER	CSAQ	PAPER	CSAQ
AS_WELL			,51	,51
AS_MORE			,36	,36
AS_HARD	,63	,63		
AS_ENJO			,46	,46
AS_GOOD	,79	,79		
AS_QUIC			,70	,70

The Table 7-27 shows correlations between manifest and latent variables for the two modes of data collection. Since the model is fully constrained, correlations are the same for both modes.

Table 7.28: Relations (correlations) in model where every parameter is free over groups

	diff_m		enjoy_m	
Relation	PAPER	CSAQ	PAPER	CSAQ
AS_WELL			,52	,34
AS_MORE			,37	,22
AS_HARD	,63	,73		
AS_ENJO			,46	,33
AS_GOOD	,80	,69		
AS_QUIC			,70	,74

In the Table 7-28 correlations between manifest and latent variables are shown for the two modes of data collection. Since the model is not constrained correlations for the two modes differ.

7.6 Analyses of missing values in CSAQ

Another data quality indicator used in the analysis was **analysis of missing values**. Previous empirical research (Borgers 2001) showed that it is difficult to predict item non-response by child characteristic, item characteristics, and their interaction. In our case, item non-response is relatively rare.

In order to do analysis on missing data, all variables in the questionnaire were recoded into: 0=missing and 1=observed. Here we analyse only the questions (items), all respondents saw in the questionnaire.

For each respondent the number of missing values is computed:

Table 7.29: Frequency for missing items

		N	%	Valid %	Cumulative %
Valid	1,00	53	40.8	40.8	40.8
	2,00	42	32.3	32.3	73.1
	3,00	13	10.0	10.0	83.1
	4,00	7	5.4	5.4	88.5
	5,00	5	3.8	3.8	92.3
	6,00	4	3.1	3.1	95.4
	7,00	1	.8	.8	96.2
	9,00	1	.8	.8	96.9
	10,00	1	.8	.8	97.7
	16,00	1	.8	.8	98.5
	28,00	1	.8	.8	99.2
	36,00	1	.8	.8	100.0
	Total	130	100.0	100.0	

As seen from the Table 7-29, each respondent did not answer at least one question. Most of the respondents did not answer one or two questions (73.1%), but we also see that there were individuals who did not answer up to 36 questions.

In further analysis we try to explain the number of missing values in the computerized questionnaire by respondents' characteristics. Our hypothesis is that respondents with higher cognitive level give less item non-response in computer-assisted questionnaire.

We also test if gender of a respondent and experience with computers influence number of item non-response.

Table 7.30: Correlation analyses for missing values

		missing values	INDEX of cognitive level	Time	Inex of computer use
missing values	Pearson Correlation	1	-.224(**)	-.238(**)	-.202(*)
	Sig. (2-tailed)	.	.009	.005	.020
	N	135	135	135	133
INDEX of cognitive level	Pearson Correlation	-.224(**)	1	-.221(**)	.273(**)
	Sig. (2-tailed)	.009	.	.010	.002
	N	135	135	135	133
Time	Pearson Correlation	-.238(**)	-.221(**)	1	.100
	Sig. (2-tailed)	.005	.010	.	.252
	N	135	135	135	133
NTILES of computer use	Pearson Correlation	-.202(*)	.273(**)	.100	1
	Sig. (2-tailed)	.020	.002	.252	.
	N	133	133	133	133

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Correlation analysis shows that all variables of our interest are correlated. Correlations are not very high (r<0.250), but they are all significant.

Table 7.31: Mean item non-response according to gender of a respondent

gender	Mean	N	Std. Deviation
girl	1.87	68	1.11843
boy	4.33	63	7.47253
Total	3.05	131	5.36701

We were interested if gender of a respondent influences number of missing values.

The Table 7-31 shows that on the average, boys produced more item non-response compared to girls. The difference between girls and boys is statistically significant. ($F=7.233$, $df=1$, $p<0.05$).

According to empirical research and theory, less cognitively sophisticated respondents give more item non-response than respondents who are more cognitively developed (Fuchs 2002). Analysis of missing data and index of cognitive level shows: Item non-response in group 1 (index of cognitive development below average) was almost 9% in the second group (index of cognitive development average) was much lower – 2.7% and in the third group it was 1.6%. These results support the previous findings – less cognitively skilled respondents produced more item non-response.

Table 7.32: Mean values of item non-response according to index of cognitive level

	missing values			
Index of cognitive level	Mean	Maximum	Minimum	Std Deviation
below average	5.44	41,00	1,00	10,00
average	2.42	10,00	1,00	2,13
above average	2.10	7,00	1,00	1,16

On average, pupils in the first group (cognitive development below average) gave more (5.4) item non-response compared to the second group (cognitive development average) and third group (cognitive development above average). The average number of missing items in the second and third groups was 2.4 and 2.1. The differences between groups are statistically significant ($F=4.316$, $df=2$, $p=0.010$) Although post hoc analysis shows that only the first group of respondents significantly differs from other two.

7.6.1 Missing values according to the time spent to complete the questionnaire

The use of computerized questionnaires enabled us to measure time spent for completing the questionnaires. Not surprisingly, respondents with more missing items completed the questionnaire faster.

Table 7.33: Number of missing items according mean time spent for completing the CSAQ

		Mean	Std Deviation	Minimum	Maximum	Valid N
missing values	1,00	0:10:30	0:03:29	0:05:09	0:22:13	53
	2,00	0:11:05	0:03:27	0:05:04	0:20:05	44
	3,00	0:11:57	0:04:06	0:07:05	0:23:42	13
	4,00	0:09:13	0:02:08	0:06:20	0:12:04	7
	5,00	0:08:36	0:02:43	0:05:49	0:12:10	5
	6,00	0:11:55	0:04:01	0:07:37	0:17:14	4
	7,00	0:08:00	0:02:04	0:06:32	0:09:28	2
	9,00	0:06:43	.	0:06:43	0:06:43	1
	10,00	0:04:42	.	0:04:42	0:04:42	1
	16,00	0:06:29	.	0:06:29	0:06:29	1
	28,00	0:08:26	.	0:08:26	0:08:26	1
	36,00	0:04:01	.	0:04:01	0:04:01	1
	38,00	0:06:58	.	0:06:58	0:06:58	1
	41,00	0:07:02	.	0:07:02	0:07:02	1

Table 7-34 shows the number of missing items according to the time needed to complete the questionnaire. As visible, respondents who didn’t answer up to three items, spent an average of approximately eleven minutes. But as the table shows, standard deviations for time spent are quite high.

7.6.2 Missing values according to computer use and attitudes towards computers

One of our research questions was whether computer skills influence data quality in computer-assisted self-administered surveys. Besides questions about place of use and frequency of computer use, there were also some questions about how much a respondent likes to use a computer, whether he/she is afraid to use it.

Previous results have already shown that respondents who use computers often gave less reliable answers compared to respondents who use computer rarely. Our next concern is if there is a difference in the number of missing items according to the frequency of computer use. Again the results show that respondents who reported more often use of computer produce less quality data. On average, respondents reporting often use of computers produced 3.6 missing items, while mean value of missing items for respondents who reported rare use of computers was 1.9 (p=0.02).

Table 7.34: Mean number of missing items according to index of computer use

Index of comp. use	Mean	Std. Dev.	N
High	3.59	5.60283	69
Low	1.91	1.15083	64
Total	2.78	4.18572	133

Two indicators of data quality (construct reliability and missing values) showed that respondents using computers rarely produce higher quality data, compared to respondents who use computers more often. Obviously, computer skills do influence the quality of survey data. Although our expectation would be that respondents with better computer skills produce better quality data. One possible explanation for these results is Krosnick's satisficing theory (Krosnick 1999). Respondents who use computers more often were more confident and went through the questionnaire less carefully, while less experienced users were more thorough and therefore produced better quality data.

Table 7.35: Mean number of missing items according to liking a computer

How much would you say that you like using a computer?	Mean	Std Dev.	N
Don't like at all	4.32	7.46	22
Don't like	1.00	.	1
Neither like or dislike	1.60	.70	10
Like	1.83	.91	36
Like a lot	3.54	5.88	65

Since values of some cells are very small (below N=30) we use results just as information and do not make statistical conclusions. Although some of the categories are small we see that respondents who like using computers a lot and respondents who don't like using computers at all produced the most item non-response (mean > 3.5).

Table 7.36: Mean number of missing items according to being afraid of computer

Are you ever afraid to use a computer?	Mean	Std Dev.	N
Yes	4.56	8,13	18
No	3.01	5,13	89
Don't know	2.08	1,35	25

Respondents who said they are afraid to use a computer produced more item non-response (4.6) compared to respondents who are not afraid to use a computer (3.01).(p=0.306).

Even though both Table 7-36 and Table 7-37 are more of an informative nature and we do not make conclusions from their results, we believe that the quality of responses provided from children who do not like using computers is not (significantly) worse.

7.6.3 Comparison between missing values in CSAQ and paper-and-pencil questionnaire

As questionnaires for two modes were not identical, we do not compare questionnaires as a whole, but only the parts with the same questions. Although we are well aware of the fact that for unbiased results questionnaires should be designed to be as similar as possible in appearance.

Therefore, we compare the sum of missing values on attitudes towards reading (CSAQ and PIRLS), questions about reading ability (CSAQ and PIRLS), attitudes towards mathematics (CSAQ and TIMSS) and questions about time consumption (CSAQ and TIMSS).

Table 7.37: Missing items – attitudes towards reading in CSAQ and PAPI

		CSAQ		PAPER (PIRLS)	
		items	Col Response %	items	Col Response %
Attitudes towards reading (6 items)	missing	41	5.1%	426	2.4%
	not missing	769	94.9%	17418	97.6%

Table 7.38: Missing items – reading ability in CSAQ and PAPI

		CSAQ		PAPER (PIRLS)	
		items	Col Response %	items	Col Response %
Reading ability (4 items)	missing	22	4.1%	180	1.5%
	not missing	518	95.9%	11716	98.5%

Table 7.39: Missing items – attitudes towards mathematics in CSAQ and PAPI

		CSAQ		PAPER (TIMSS)	
		items	Col Response %	items	Col Response %
Attitudes towards math (6 items)	missing	30	3.7%	976	5.1%
	not missing	780	96.3%	18188	94.9%

Table 7.40: Missing items – time consumption in CSAQ and PAPI

		CSAQ		PAPER (TIMSS)	
		items	Col Response %	items	Col Response %
Activities outside school (7 items)	missing	65	6.0%	1374	5.4%
	not missing	1015	94.0%	24178	94.6%

As seen from Table 7-37 to Table 7-40, there are some differences between the questionnaire mode, but from results shown it is hard to say which mode gives better results. In the case of attitudes towards reading we see that the percentage of missing items is 2.5% lower in paper-and-pencil, compared to computerized questionnaire. The difference between the two modes is statistically significant (p=0.02). At questions regarding reading ability, children responding to the paper-and-pencil questionnaire gave very little item non-response (1.4%) compared to the computerized questionnaire (4.1%) and the difference is statistically significant (p=0.00). When children responded to attitudes toward mathematics, there were fewer missing items in the computerized questionnaire (p=0.39) and in case of questions regarding time consumption we see, the difference between modes is very small (0.6% better for paper-and-pencil). From the analyses we see that the biggest difference in item non-response was between PIRLS questionnaire and CSAQ.

With the intention to see how respondents behave (regarding missing items) we compare percentage of missing items for both modes according to index of cognitive level. For further analysis we use the same variables as we used for reliability testing – attitudes towards reading and attitudes towards mathematic.

Table 7.41: Attitudes toward reading in CASQ

	INDEX of cognitive level					
	Below average		Average		Above average	
CSAQ	Count	Col %	Count	Col %	Count	Col %
AS_MUST	41	91.1%	47	97.9%	42	100.0%
AS_TALK	40	88.9%	47	97.9%	41	97.6%
AS_PRESENT	40	88.9%	44	91.7%	42	100.0%
AS_BORING	40	88.9%	47	97.9%	41	97.6%
AS_FUTURE	40	88.9%	47	97.9%	42	100.0%
AS_ENJOY	39	86.7%	47	97.9%	42	100.0%

Table 7-41 shows that in the group of pupils with index of cognitive development below average contains the most respondents who did not answer questions. In the group of respondents with index of cognitive development above average, there are only two missing items, while in the other two groups we have missing data on all attitudes.

Table 7.42: Attitudes toward reading in paper-and-pencil questionnaire

PIRLS	INDEX of cognitive level					
	Below average		Average		Above average	
	Count	Col %	Count	Col %	Count	Col %
AS_MUST	889	96.1%	1011	98.6%	1012	98.8%
AS_TALK	895	96.8%	1008	98.3%	1009	98.5%
AS_PRESENT	883	95.5%	995	97.1%	1004	98.0%
AS_BORING	880	95.1%	991	96.7%	997	97.4%
AS_FUTURE	897	97.0%	1013	98.8%	1010	98.6%
AS_ENJOY	899	97.2%	1013	98.8%	1012	98.8%

Table 7-42 shows the same pattern in paper-and-pencil questionnaire mode as in CSAQ mode. Although item non-response in the group of respondents who are less cognitively sophisticated is lower compared to CSAQ mode. On the other hand, the results show that the most cognitively sophisticated respondents gave the least item non-response in CSAQ mode.

Table 7.43: Attitudes toward mathematics in CSAQ

CSAQ	INDEX of cognitive level					
	Below average		Average		Above average	
	Count	Col %	Count	Col %	Count	Col %
AS_WELL	40	88.9%	48	100.0%	42	100.0%
AS_MORE	40	88.9%	48	100.0%	42	100.0%
AS_HARD	41	91.1%	48	100.0%	42	100.0%
AS_ENJO	40	88.9%	46	95.8%	40	95.2%
AS_GOOD	41	91.1%	48	100.0%	42	100.0%
AS_QUIC	42	93.3%	48	100.0%	42	100.0%

The table shows that the most missing items appear in the group of respondents with below average cognitive level, while in groups with respondents with average or above average cognitive level there are almost no missing items.

All three tables (Table 7-41 to Table 7-43) show that respondents who are cognitively more sophisticated produced less item non-response in both modes. The results are in accordance with findings of Borgers (2000) who showed that cognitive skills influence missing data.

Cognitive level is not computed for paper-and-pencil mode of TIMSS questionnaire; therefore we did not compare the two modes.

7.6.4 Time spent to answer computer-assisted questionnaire

In the final part of analysis we were interested in how much time the respondents needed to answer the questionnaire, what influenced the speed of completing the questionnaire and if previous computer skills correlated with the time the respondent needed to answer all the questions.

Table 7.44: Average time to complete the questionnaire

Time to complete the questionnaire	N	Min	Max	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Time	130	0:04:01	0:23:42	0:10:31	0:00:18	0:03:32
Valid N (listwise)	130					

The minimum time spent for completing a questionnaire was 4:01 minutes and the maximum was 23:42 minutes (std. dev. 3:32), but the average time spent was 10:31 minutes.

Did girls and boys differ according to the time spent to answer a questionnaire?

Table 7.45: Time spent to answer questionnaire according to gender

gender	Mean	N	Std. Dev.	Std. Error of Mean
girl	0:11:10	68	0:03:29	0:00:25
boy	0:09:47	62	0:03:28	0:00:26
Total	0:10:31	130	0:03:32	0:00:18

Boys completed the questionnaire 2 and a half minutes faster and the difference between the two groups is statistically significant ($F=5.543$, $df=1$, $p=0.02$). There are at least two possible reasons why boys completed the questionnaire faster than girls – they are more experienced in computer use or they use satisficing strategy more often, which means they do not go through all the phases as carefully as girls.

We know that boys produced more item non-response than girls; they were faster at responding to questionnaire, which leads us to the thought that they used satisficing strategy more often than girls.

How fast a respondent completed the questionnaire is also correlated to the index of cognitive development. ($r= -0.221$; correlation is significant at 0.01 level)

Table 7.46: Time spent to complete the questionnaire according to index of cognitive level

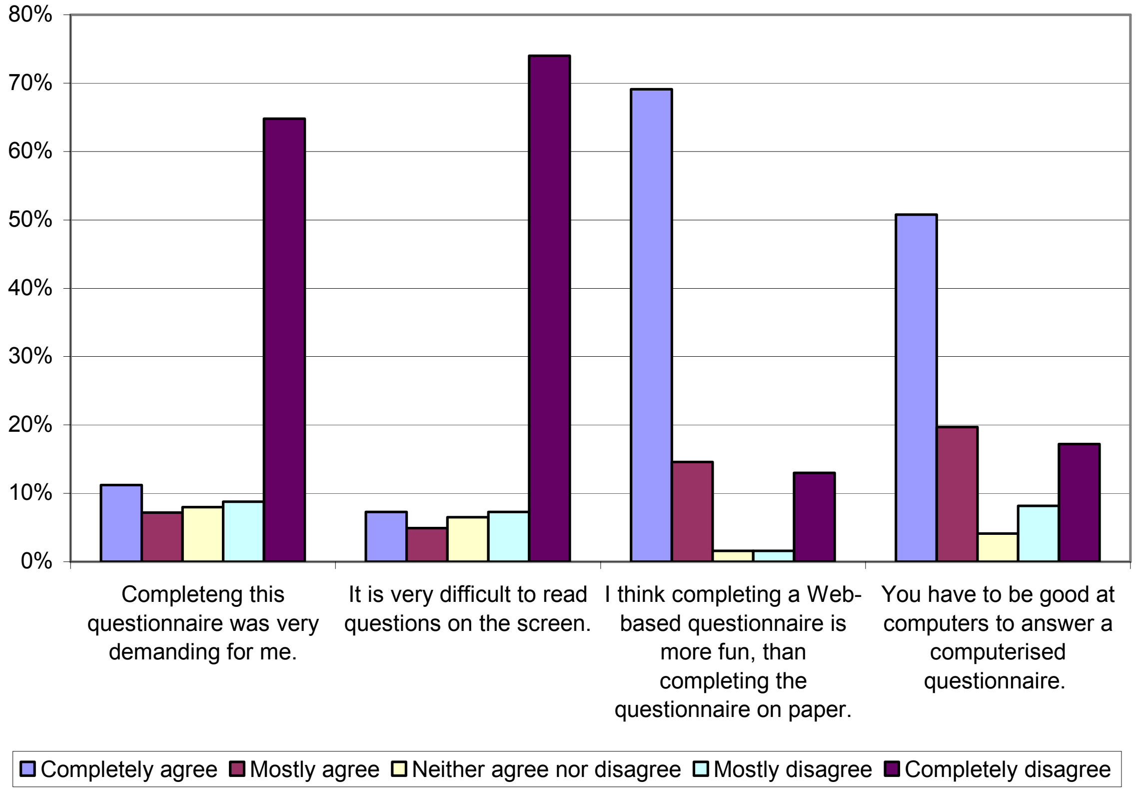
INDEX of cognitive level	Mean	N	Std. Deviation	Std. Error of Mean
Below average	0:11:52	41	0:04:36	0:00:43
Average	0:10:03	47	0:02:55	0:00:25
Above average	0:09:42	42	0:02:31	0:00:23
Total	0:10:31	130	0:03:32	0:00:18

Table7-49 shows that respondents with index of cognitive development below average spent more time for completing the questionnaire than other two groups. Standard deviation is also the highest in that group. The differences are significant between the first and the other two groups of respondents (p=0.01).

7.6.5 Attitudes about the questionnaire

At the end of the questionnaire respondents answered four statements about the questionnaire.

Picture 7.5: About the questionnaire



Respondents in general liked the computerized questionnaire – they mostly (73.6%) did not agree with the statement “Completing this questionnaire was very demanding for me”. They also did not report problems with reading questions on the screen only fifteen (12.2%) respondents said it was difficult to read questions from the screen. The majority also agreed that completing a Web-based questionnaire is more fun than completing a questionnaire on paper (83.7%). Despite that they mostly enjoyed and did not feel they had problems completing a questionnaire, the majority agreed (70.5%) that you have to have good computer skills to answer a questionnaire on the computer, one-quarter (25.4%) of the respondents did not agree with the statement. The question is how the respondents answered questions about the questionnaire according to their cognitive index. Due to small groups the following analysis in Table 7-47 is just informative and we did not make conclusions.

Table 7.47: About the questionnaire according to index of cognitive level

		INDEX of cognitive level					
		Below average		Average		Above average	
		N	Col %	N	Col %	N	Col %
Completing this questionnaire was very demanding for me.	Completely agree	9	22.5%	3	6.8%	2	4.9%
	Mostly agree	5	12.5%	2	4.5%	2	4.9%
	Neither agree nor disagree	3	7.5%	6	13.6%	1	2.4%
	Mostly disagree	3	7.5%	3	6.8%	5	12.2%
	Completely disagree	20	50.0%	30	68.2%	31	75.6%
It is very difficult to read questions on the screen.	Completely agree	6	15.4%	3	7.0%		
	Mostly agree	3	7.7%	3	7.0%		
	Neither agree nor disagree	2	5.1%	4	9.3%	2	4.9%
	Mostly disagree	3	7.7%	3	7.0%	3	7.3%
	Completely disagree	25	64.1%	30	69.8%	36	87.8%
I think completing a Web-based questionnaire is more fun than completing a questionnaire on paper.	Completely agree	24	61.5%	30	69.8%	31	75.6%
	Mostly agree	4	10.3%	7	16.3%	7	17.1%
	Neither agree nor disagree	1	2.6%	1	2.3%		
	Mostly disagree	2	5.1%				
	Completely disagree	8	20.5%	5	11.6%	3	7.3%
You have to be good at computers to answer a computerized questionnaire.	Completely agree	25	65.8%	28	63.6%	9	22.5%
	Mostly agree	3	7.9%	4	9.1%	17	42.5%
	Neither agree nor disagree	1	2.6%	2	4.5%	2	5.0%
	Mostly disagree	2	5.3%	3	6.8%	5	12.5%
	Completely disagree	7	18.4%	7	15.9%	7	17.5%

Despite small groups we see a certain pattern of responses and differences between groups. In the first group (group of respondents with index of cognitive development below average) there were more respondents (compared to the second and third groups) who reported that completing a questionnaire was demanding for them. The percentage of respondents who agreed with the statement was over 30% while in the other two groups this percentage was 11% and 10%. From previous analysis we know that most of the respondents agree with the statement that you have to have good computer skills to answer a computerized questionnaire. In the third group of respondents (index of cognitive development above average) the percentage of respondents who completely agree with the statement is much lower (22.5%) compared to the other two groups (65.8% and 63.6% respectively).

7.7 Observations and group discussion

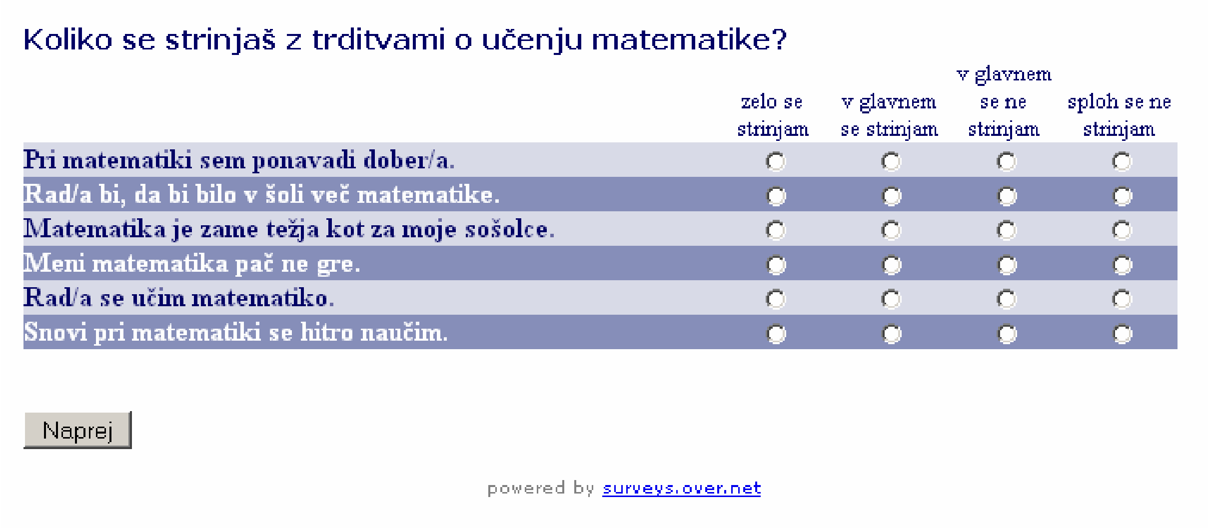
While children were completing the computerized questionnaire they were observed by a researcher and an administrator who made notes about the troubles they noticed. We discussed those troubles in the last step of the survey during a short group discussion. When all of the children had finished the computer-assisted self-administered questionnaire or the reading literacy test, we gathered them in the classroom and conducted a group discussion. The purpose of the discussion was to learn from them what they liked or didn't like in the CSAQ. They were asked if they had any difficulties with reading the text from the screen, whether the letters were big enough, and what form of questions they found easier to read and answer. The discussion lasted up to 20 minutes.

The first reaction of children was: "Everything was great. There is no need to change anything." But through the discussion, we did get some valuable information.

The size of the text was not problematic and most of the children said they had no problems reading the text from the screen. They all (with very few exceptions) read the introductory text and had no problems with entering the ID number. The problems appeared when they had to scroll down the page (one page of the questionnaire was intentionally left longer). Some of the children didn't know how to scroll down the page and they needed help. In the questionnaire there was also one open-ended question: How much time, would you say, have you spent to complete the questionnaire? Although the question turned out to be too demanding for children and we couldn't use the results, it enabled us to see that most of them had troubles filling in the answer. When they came to the question, they were lost. They didn't know how to move the cursor into the space provided for the answer.

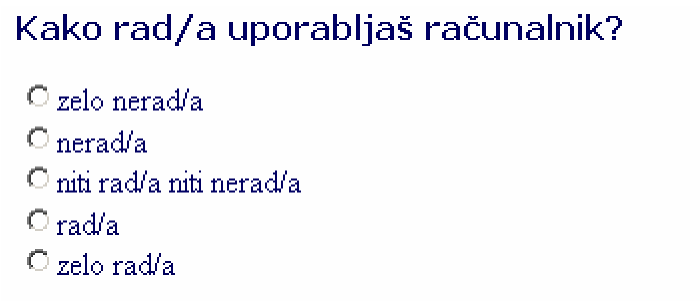
Some children reported they had problems with questions in the tabled format – some of them had problems reading answer categories. Some others had problems with following the row – they had put the answer to a question in the wrong row, into that of another question.

Picture7.6: Sample of a tabled question



There were also children who didn't report any of those troubles. Generally, they didn't have problems with questions with answers listed in a column.

Picture7.7: Sample of a question with listed answers



They also said they would prefer other colors of the page (red, yellow…).

We also observed that towards the end of the questionnaire, their concentration had dropped. (This is also shown in the empirical part of the study, where missing items are more often towards the end of the questionnaire.) They wanted to know how many pages they had to complete to get to the end. This situation mostly occurred when the children who were slowing in answering the questionnaire wanted to catch up with those who were faster (especially if they were friends). As already mentioned, in most of the schools the problem was small computer rooms. In some schools they were even too small for the whole class of students. As computers are set quite close to each other children tend to watch in each others screens or talk.

8 Summary of results and discussion

In survey research, computer-assisted forms of data collection are rapidly replacing paper-and-pencil methods. The largest surveys where children are the target population are studies in education, where self-administered paper-and-pencil methods of data collection are used. With the rapid development of computer-assisted methods of data collection, it is to be expected that at least some school-based surveys in Slovenia will also use computers as a tool to collect data from children. Our main interest and research question in this study was the quality of responses of young children to computer-assisted questionnaires.

In the theses different methods of computerized data collection methods were first presented in relation to advantages and disadvantages to other data collection methods. Then the cognitive process of answering a survey questionnaire was presented, where special attention was put to Korsnick's satisficing theory. This was followed by cognitive development stages and their relevance to surveying children. Piaget's theory of cognitive development served as a tool for global classification of developmental stages of children. Then previous findings about children as respondents were discussed. Finally, an empirical study aimed at answering research questions was presented.

Within the study we tested three hypotheses:

1. "Cognitive skills have an influence on the reliability of data collected by CSAQ, but reliability is not lower than in paper-and-pencil collection mode."
2. "Computer skills do not have a significant influence on quality of data in CSAQ."
3. "Children give less item non-response in computer questionnaires than in paper-and-pencil questionnaires."

Empirical results of the study confirm our first hypothesis. To test the first hypothesis several reliability analyses were conducted on several sets of data. Four constructs were tested; all items measuring the constructs were collected in both modes – computer-assisted and paper-and-pencil. In general Cronbach's alphas were higher for computer-assisted mode, although significance tests showed that reliability is significantly higher just for one construct. With the results we confirmed the second part of the first hypothesis. This is also in accordance with findings of de Leeuw et al. (1997) and Van Hattum and de Leeuw who found that reliability of responses in computer-assisted mode does not differ from paper-and-pencil mode when the population are children aged between eight and twelve.

Borgers (2000) showed that cognitively more sophisticated children give more reliable results to paper-and-pencil surveys. Our assumption was that the same pattern would show in computer-assisted mode as well. In order to test this, an index of cognitive level was computed on the basis of several variables: points achieved on reading literacy test, self-predicted mathematics grade, self-predicted grade in Slovenian language and self-predicted general grade. Empirical results confirm the hypothesis. Cognitively more sophisticated children give somehow more reliable results, although further analysis showed the differences between groups are not statistically significant. Further, we tested if both modes measured the same constructs on the same scales. The same constructs for reliability analyses were used. Structural equation modeling was used to test measurement and structural equivalence. Although there were some differences between models, they were not statistically significant and we concluded that the two different modes measure the same constructs on the same scales.

Reliability analyses were also performed to compare data quality of groups of respondents with high and low index of computer use. Although Cronbach's α is higher for the group of respondents who use computers rarely, the difference between the two groups is not statistically significant. But missing value analyses show that respondents who use computers rarely produced less item non-response compared to respondents who use computer more often. These results reject our second hypothesis; computer skills do influence quality of survey data. Since, our expectation would be that respondents with more computer skills produce better quality data, these findings are quite surprising. One possible explanation for these results is Krosnick's satisficing theory (Krosnick 1999). Respondents who use computers more often were more confident and went through the questionnaire less carefully, while less experienced users were more thorough and therefore produced better quality data.

Comparison of sets of data which were the same in paper-and-pencil mode and computer-assisted mode shows small differences in two modes regarding missing items. Although other authors (de Leeuw et al. 1999, Van Hattum, de Leeuw 1997) report less item non-response in computer-assisted mode, our research did not confirm that. Although the differences are not significant for all items, in general, paper-and-pencil mode produced less item non-response.

Interesting results were found when missing items in two modes were analysed according to the index of cognitive level. The results show that respondents with low index of cognitive level produced up to 10% more missing values compared to the same group of respondents in paper-and-pencil mode. On the other hand, respondents with high index of cognitive level produced less item non-response in computer-assisted mode compared to the same group in paper-and-pencil group. For both modes of data collection cognitively more sophisticated respondents produced less item non-response.

Regarding CASQ we managed to show that the position of the question in the questionnaire influences the number of missing items. Towards the end of the questionnaire the concentration of respondents dropped, and more missing items were produced. "We cannot avoid item non-response by changing the position of items in the questionnaire but we can randomize item non-response by randomizing the position of items in a questionnaire." (Borgers and Hox 2001). Randomizing items in the questionnaire is very easy with CASQ and should be used as often as possible.

Children generally liked answering the questionnaire on the computer, they found it amusing. Although when designing a CASQ one should avoid scrolling (some children had difficulties), the format of the question should allow for as easy as possible reading and filling the answer.

8.1 Limitations of the survey

The study had a few limitations. One of the biggest limitations was the sample of computer-assisted survey. The sample consisted of 135 respondents from the Ljubljana region, while the TIMSS sample consisted of 3125 respondents and PIRLS sample consisted of 3118 respondents from throughout Slovenia. Another limitation is that the questionnaires compared were not completely identical. The sets of variables used in computer-assisted mode were repeated from paper-and-pencil PIRLS 2001 questionnaire for children and from paper-and-pencil TIMSS 2003 questionnaire for children, but both questionnaires also consisted of other items. The respondents answering the computerized questionnaire were quite motivated to complete the questionnaire because after the survey they were allowed to use the computers for other purposes.

For future research it would be necessary to conduct a study with questionnaires of different modes but identical questions and as much as possible identical design and conditions.

Despite the limitations, our empirical results confirmed most of the previous results shown by other authors.

8.2 Conclusion

The current state of knowledge about interviewing young children is very fragmented. In the thesis we tried to sum up the findings from the previous research about children as respondents and conducted the empirical study, where two methods of data collection were compared. The target population of the study were children aged 9 and 10 years, who were answering computer-assisted questionnaires in a school setting.

In our study we have manly focused on personal characteristics of respondents and the hypotheses that cognitive abilities do have effect on data quality was confirmed. On the other hand, other studies show that question characteristics also affect response quality. That topic was not covered within our study and further work is recommended in that direction. We did not test how different number of response options and response order in CASQ influence the response quality, we also did not test how open ended questions work in CASQ for that age group.

A lot of attention should be put to a design of a questionnaire for children. It is recommended to make it simple, with not too many questions per page, long pages, which force the respondent to use a cursor should be avoided. It is recommended to include a progress indicator, which might help motivate the respondent. Another recommendation is to randomize the position of items in the questionnaire in order to randomize item non-response.

The introduction of CASQ in school setting usually requires the use of computer laboratories within the schools. In Slovenia there are some limitations, if one wants to survey by CASQ the whole class of students at the same time. Some of the schools have too small computer rooms and sometimes only half of the students form a classroom can be surveyed at the same time.

From the study it can be concluded that computer-assisted data collection is appropriate method for surveying, even when the subjects are young children. The data obtained by CASQ is of good quality, although it should be noted, that both; personal characteristics (especially cognitive abilities) and question characteristics (question difficulty) have an effect on response quality. Much of the findings from computer assisted survey about children as respondents are in concordance with previously conducted paper and pencil surveys.

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Summary in Slovene language

Vpliv kognitivnih sposobnosti in spretnosti pri uporabi računalnika na kakovost podatkov v računalniškem samoanketiranju

O metodah zbiranja podatkov in kakovosti podatkov je bilo že veliko napisanega. Vendar pa teorije o anketni metodologiji večinoma lahko apliciramo na odraslo populacijo, o anketiranju otrok pa vemo relativno malo. Ker se otrokove kognitivne, družbene in komunikacijske sposobnosti še razvijajo, so v družboslovnem raziskovanju obravnavani kot posebna populacija in vprašalniki namenjeni otrokom morajo biti razviti še posebno skrbno in natančno.

V Sloveniji se na področju šolstva izvaja precej raziskav, kjer so seveda ciljna populacija otroci. Trenutno otroci še izpoljnjujejo anketne vprašalnike na papirju, vendar pa lahko pričakujemo, da bo v prihodnosti tudi med otroki potekalo računalniško podprto zbiranje podatkov, saj tako na nacionalnem kot tudi mednarodnem nivoju že potekajo raziskave v šolah, kjer učitelji izpolnjujejo računalniško podprte vprašalnike (npr. RIS[6], SITES[7]).

Računalniško podprto anketiranje danes ni več novost. Vse več raziskav je, kjer se tradicionalni vprašalniki v papirni obliki nadomeščajo z računalniško podprtimi. Število raziskav, v katerih se proučujejo različni metodološki vidiki računalniškega samoanketiranja je precejšnje, vendar pa so ciljna populacija vseh teh raziskav odrasli (npr. Dillman 1998, Lozar Manfreda in Vehovar 2002, Descombes 2005).

Obravnavana populacija v magistrskem delu so otroci stari 9 in 10 let. Osnovno raziskovalno vprašanje je ugotoviti kakovost podatkov pridobljenih z računalniško podprtim samoanketiranjem med otroki starimi 9 in 10 let.

Magistrsko delo sestavlja več sklopov – v prvem delu so predstavljene različne metode zbiranja podatkov, pri čemer se osredotočamo na računalniško podprto anketiranje ter njegove prednosti in omejitve glede na druge metode zbiranja podatkov. V nadaljevanju je

[6] Raba Interneta v Sloveniji

predstavljen kognitivni proces, ki se odvija med odgovarjanjem na anketni vprašalnik. V tem delu smo nekaj več pozornosti namenili t.i. teoriji zadoščanja (ang. satificing theory), ki jo povzemamo po Krosnicku (Krosnick 1999). V tretjem delu je predstavljena teorija kognitivnega razvoja otrok in kognitivne stopnje predvsem s stališča primernosti metod zbiranja podatkov za določeno kognitivno stopnjo. Temu del, v katerem so predstavljene nekatere do sedaj opravljene empirične raziskave o anketiranju otrok in postavitev hipotez. Z metodologijo anketiranja otrok se ukvarja relativno malo avtorjev, precej dela na tem področju je opravila N. Borgers, ki proučuje povezavo kognitvnega razvoja s kakovostjo podatkov pridobljenih z anketnimi vprašalniki.

Zadnj sklop pa predstavljjo rezultati empirične raziskave s katero testiramo naslednje hipoteze:

- Kognitivne sposobnosti vpivajo na zanesljivost podatkov zbranih z računalniško podprtim samoanketiranjem, vendar zanesljivost ni nižja kot v samoanketranju s papirnimi vprašalniki.
- Računalniške spretnosti nimajo statistično značilnega vpliva na kakovost podatkov zbranih z računalniško podprtim samoanketiranjem.
- Število manjkajočih odgovorov je nižje v računalniško podprtem samoanketiranju kot v samoanketiranju s papirnimi vprašalniki.

Za testiranje hipotez so bili uporabljene tri baze podatkov - dve predhodno zbrani z metodo pisnega samoanketiranja ter baza podatkov, ki smo jih zbrali z računalniško podprtim anketnim vprašalnikom, razvitim za namen pričujočega magistrskega dela. Poleg tega smo za potrebe ugotavljanja stopnje kognitivnega razvoja izvedli krajši test bralne pismenosti.

Za testiranje prve hipoteze smo uporabili statistično metodo analize zanesljivosti. Analizirali smo štiri teoretične konstrukte, ki so bili izmerjeni v obeh načinih (samo)anketiranja – papirnem in računalniško podprtem. Ugotovili smo, da so Crombachove alfe sicer višje v podatkih pridobljenih z računalniško podprtimi anketami, vendar pa smo s testi statistične značilnosti pokazali, da je zanesljivost statistično značilno različna le pri enem teoretičnem konstruktu. Z dobljenimi razultati smo potrdili drugi del prve hipoteze – zanesljivost podatkov dobljenih z računalniško podprtim samoanketiranjem ni statistično značilno nižja od metode zbiranja podatkov z vprašalniki v papirni obliki. Te ugotovitve sovpadajo z

[7] Second Information on Technology in Education

ugotovitvami drugih avtorjev (De Leeuw et al 1997, Van Hattum and De Leeuw 1999), ki so ugotovili, da v populaciji otrok starih med 8 in 12 let zanesljivost podatkov zbranih z računalniškim samoanketiranjem ni nižja od tistih zbranih s papirno metodo.

Borges (2000) ugotavlja, da so bolj zanesljivi podatki (zbrani z vprašalniki v papirni obliki) tistih otrok, ki imajo bolj razvite kognitivne sposobnosti. Naša predpostavka je, da to drži tudi za podatke zbrane z računalniško podprtimi vprašalniki. Z empiričnimi rezultati smo potrdili tudi prvi del prve hipoteze, da otroci z bolj razvitimi kognitivnimi sposobnostmi odgovarjajo nekoliko bolj zanesljivo, vendar pa so nadaljne analize pokazale, da rezultati med skupinami niso statistično značilni.

V nadaljevanju smo s strukturnimi modeli testirali ali z dvema različnima metodama zbiranja podatkov merimo iste teoretične konstrukte. Čeprav je bilo med modeli nekaj razlik, niso bili statistično značilni. Ugtovili smo, da z dvema metodama zbiranja podatkov merimo enake teoretične konstrukte na enakih lestvicah.

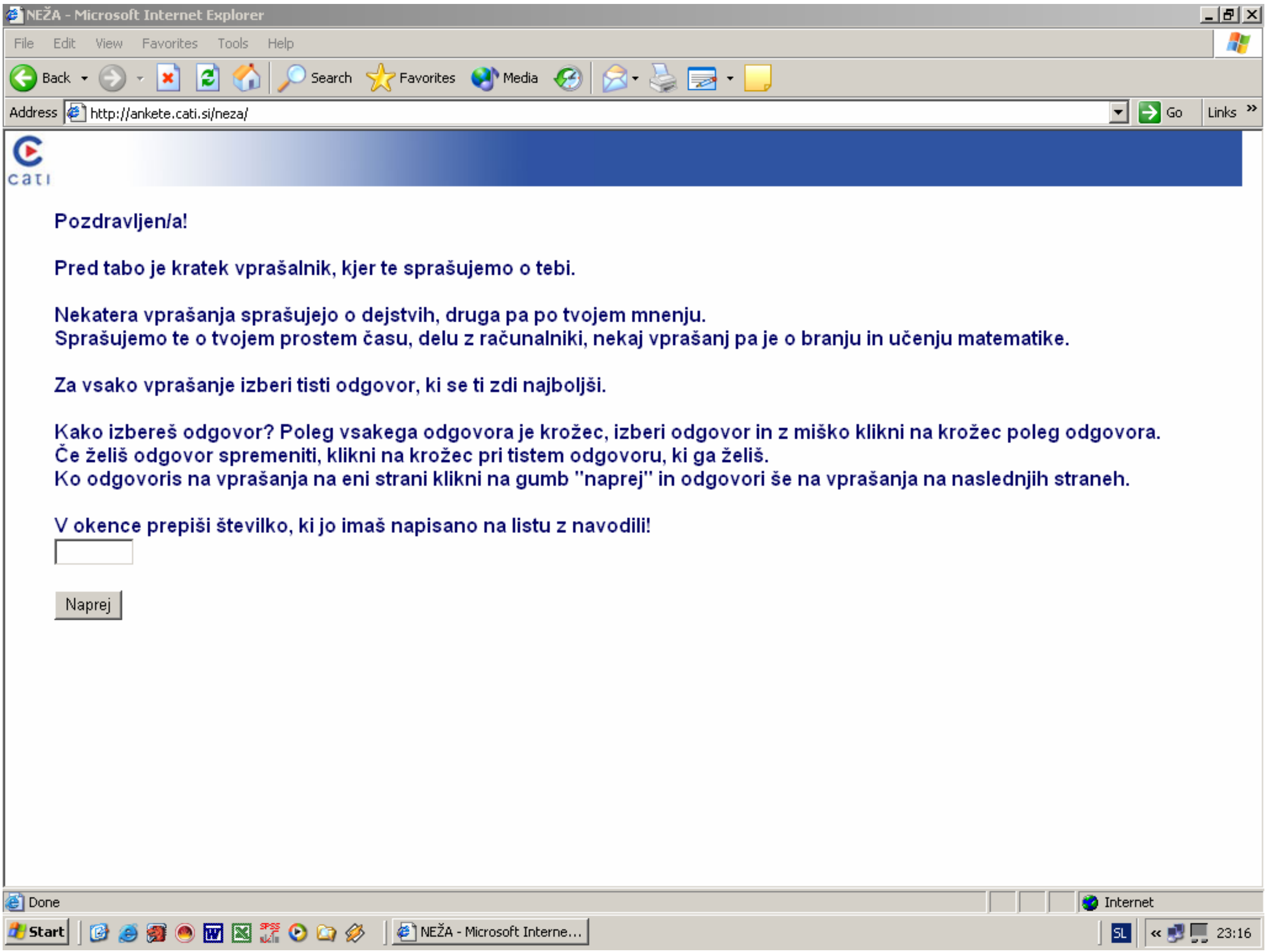
Prav tako smo opravili statistične analize zanesljivosti merjenja za primerjavo kakovosti podatkov med skupinami respondentov z visokim in nizkim indeksom uporabe računalnika. Ugotovili smo, da so odgovori respondentov, ki uporabljajo računalnik manj pogosto nekoliko bolj zanesljivi, vendar pa razlike med skupnami niso statistično značilne. Vendar pa analiza manjkajočih podatkov pokaže, da je v skupini respondentov z nizkim indeksom uporabe računalnika, število manjkajočih odgovorov nižje v primerjavi z respondenti, ki imajo visok indeks uporabe računalnikov. S temi rezultati smo zavrnili drugo hipotezo. Spretnost uporabe računalnika vpliva na kakovost podatkov. Ti rezultati so nekoliko presenetljivi, saj bi pričakovali, da bodo podatki respondentov, ki so spretenejši pri uporabi računalnika, bolj kakovostni. Ena od možnih razlag za te rezultate je Krosnickova teorija zadoščanja. Respondenti, ki pogosteje uporabljajo računalnik, so bili pri delu bolj samozavestni in ne tako natančni kot respondenti, ki uporabljajo računalnik manj pogosto in so bili zato bolj pozorni in natančni pri izpoljnevanju vprašalnika.

Primerjave sklopov podatkov, ki so bili enaki v obeh metodah zbiranja podatkov, kažejo na majhne razlike med metodama glede na manjkajoče odgovore. Čeprav nekateri avtorji (De Leeuw et all 1999, Van Hattum, De Leeuw 1997) poročajo manjše število neodgovorov v računalniško podprtem anketiranju, naša raziskava tega ni potrdila. Razlike sicer niso statistično značilne za vse analizirane spremenljivke, vendar pa razultati kažejo, da je manjše število neodgovorov v papirni obliki vprašalnika. S temi rezultati pa smo zavrnili tretjo hipotezo.

Appendix

A. Reading literacy test

B. Questionnaire



Pozdravljen/a!

Pred tabo je kratek vprašalnik, kjer te sprašujemo o tebi.

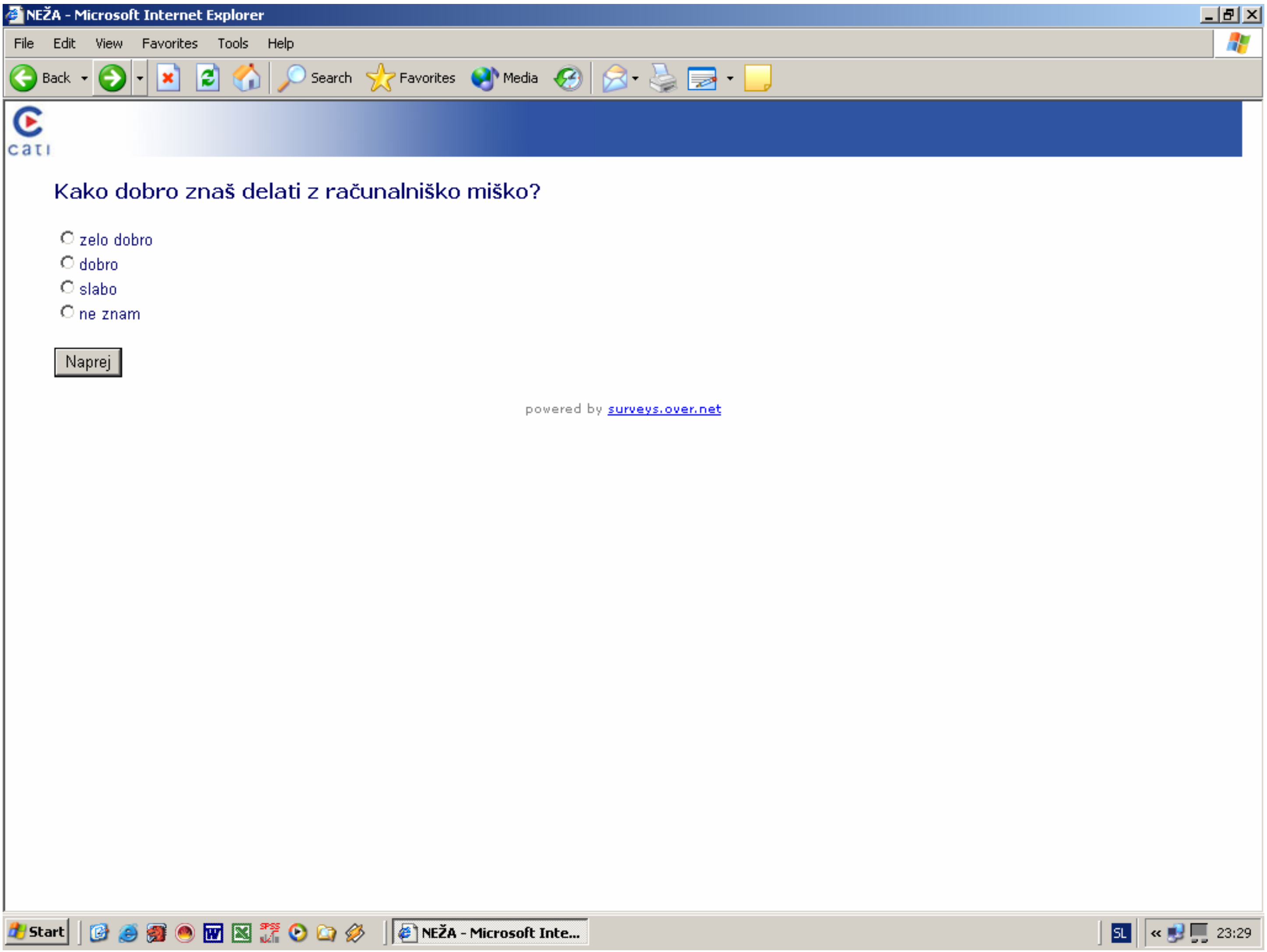
Nekatera vprašanja sprašujejo o dejstvih, druga pa po tvojem mnenju.
Sprašujemo te o tvojem prostem času, delu z računalniki, nekaj vprašanj pa je o branju in učenju matematike.

Za vsako vprašanje izberi tisti odgovor, ki se ti zdi najboljši.

Kako izbereš odgovor? Poleg vsakega odgovora je krožec, izberi odgovor in z miško klikni na krožec poleg odgovora.
Če želiš odgovor spremeniti, klikni na krožec pri tistem odgovoru, ki ga želiš.
Ko odgovoris na vprašanja na eni strani klikni na gumb "naprej" in odgovori še na vprašanja na naslednjih straneh.

V okence prepiši številko, ki jo imaš napisano na listu z navodili!

Naprej


NEŽA - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
cati
Kako dobro znaš delati z računalniško miško?
zelo dobro
dobro
slabo
ne znam
Naprej
powered by surveys.over.net
Start
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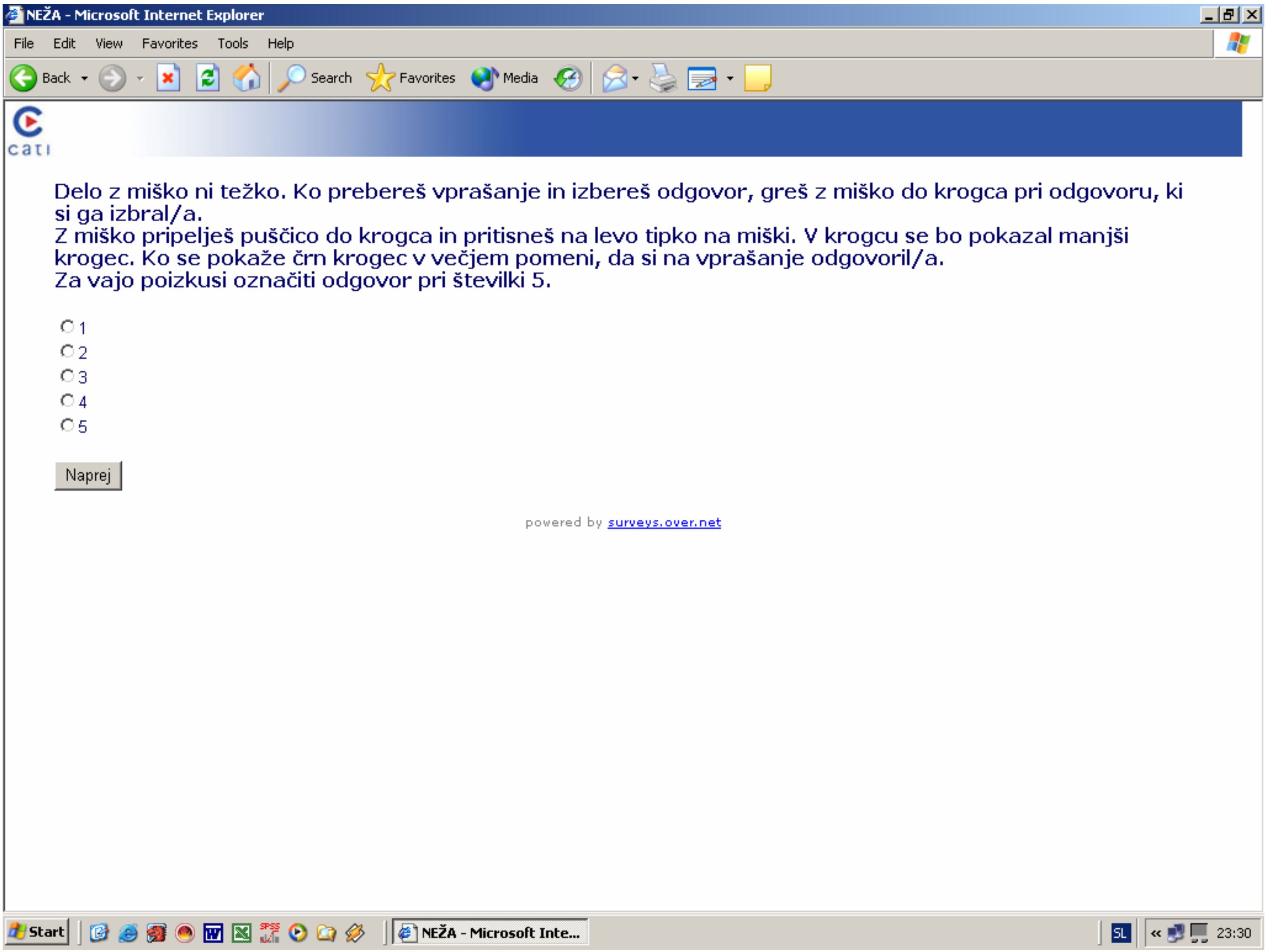
SL
23:29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cati
Delo z miško ni težko. Ko prebereš vprašanje in izbereš odgovor, greš z miško do krogca pri odgovoru, ki si ga izbral/a.
Z miško pripelješ puščico do krogca in pritisneš na levo tipko na miški. V krogcu se bo pokazal manjši krogec. Ko se pokaže črn krogec v večjem pomeni, da si na vprašanje odgovoril/a.
Za vajo poizkusi označiti odgovor pri številki 5.
1
2
3
4
5
Naprej
powered by surveys.over.net
Start
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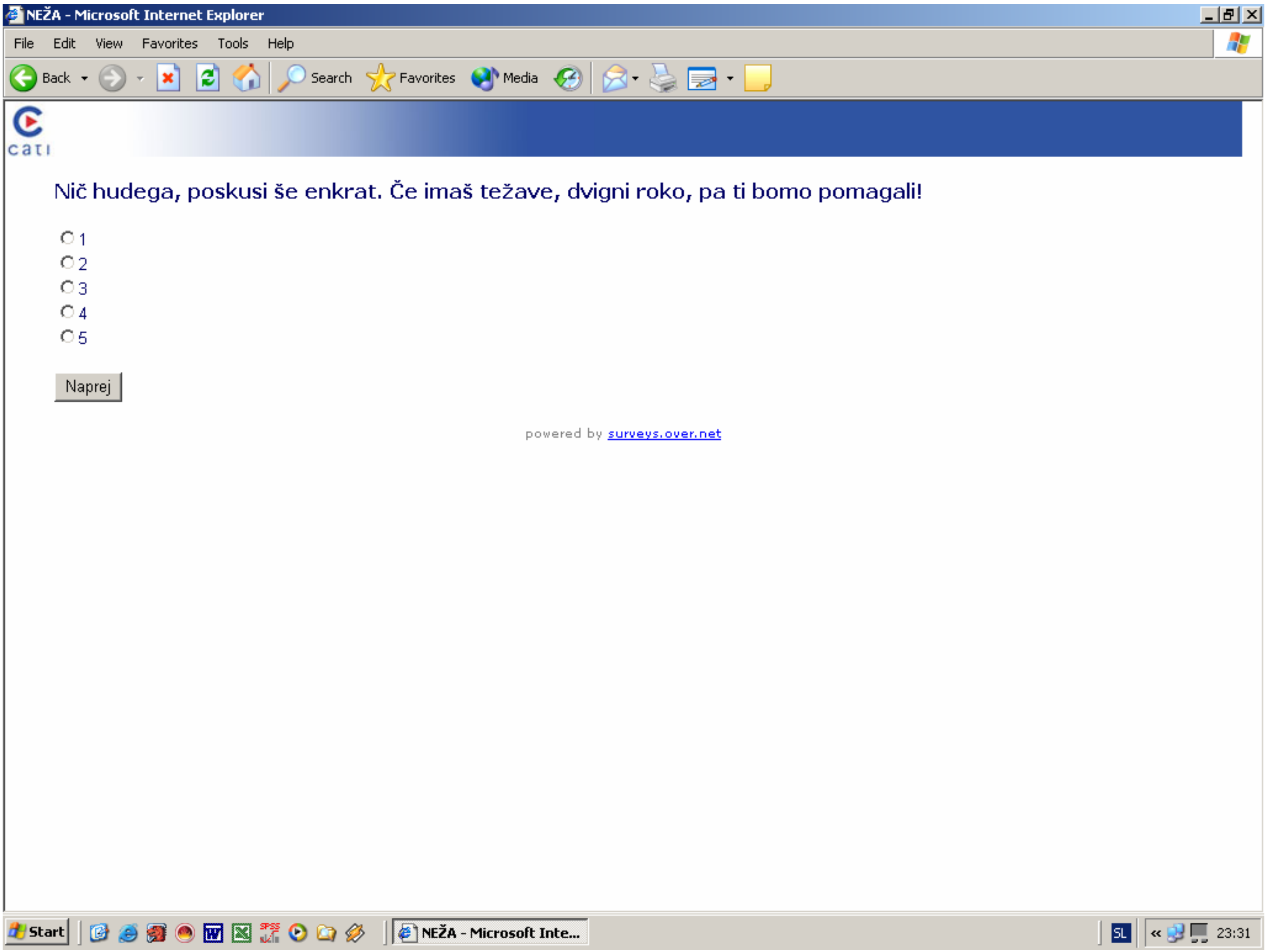
SL
23:30


NEŽA - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
cati
Nič hudega, poskusi še enkrat. Če imaš težave, dvigni roko, pa ti bomo pomagali!
1
2
3
4
5
Naprej
powered by surveys.over.net
Start
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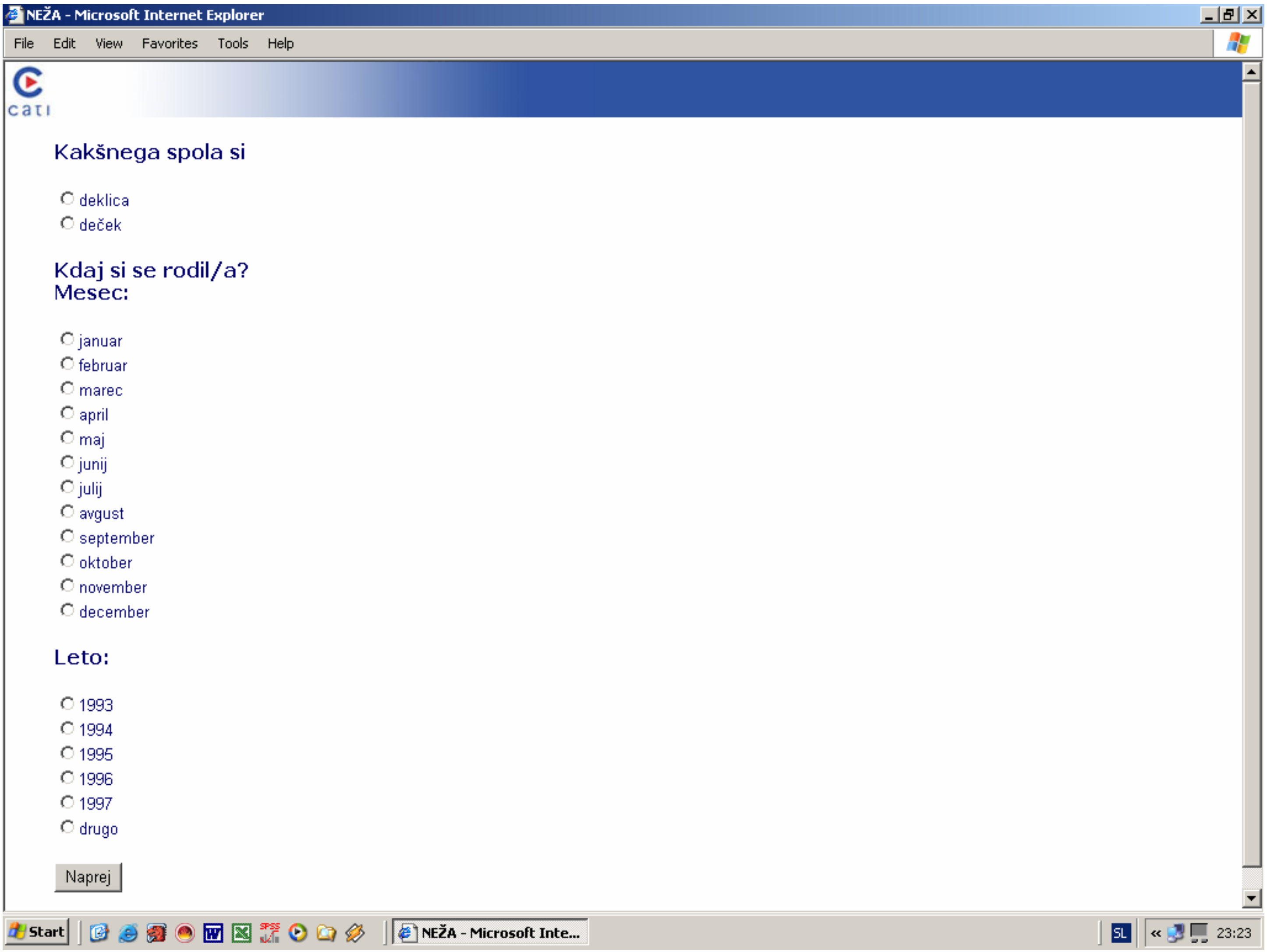
SL
23:31



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cati
Kakšnega spola si
deklica
deček
Kdaj si se rodil/a?
Mesec:
januar
februar
marec
april
maj
junij
julij
avgust
september
oktober
november
december
Leto:
1993
1994
1995
1996
1997
drugo
Naprej
Start
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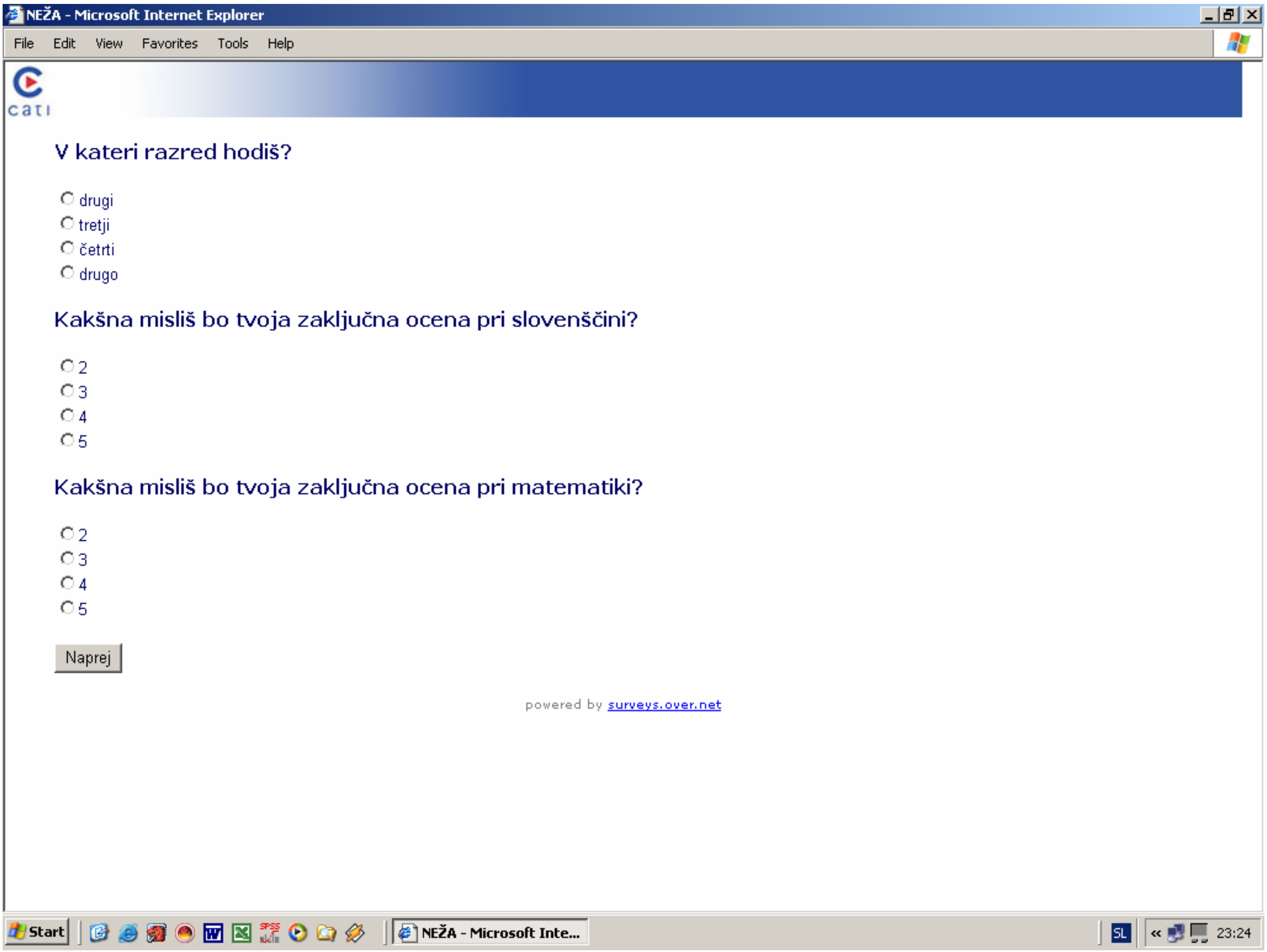
SL
23:23


NEŽA - Microsoft Internet Explorer
File Edit View Favorites Tools Help
cati
V kateri razred hodiš?
drugi
tretji
četrti
drugo
Kakšna misliš bo tvoja zaključna ocena pri slovenščini?
2
3
4
5
Kakšna misliš bo tvoja zaključna ocena pri matematiki?
2
3
4
5
Naprej
powered by surveys.over.net
Start
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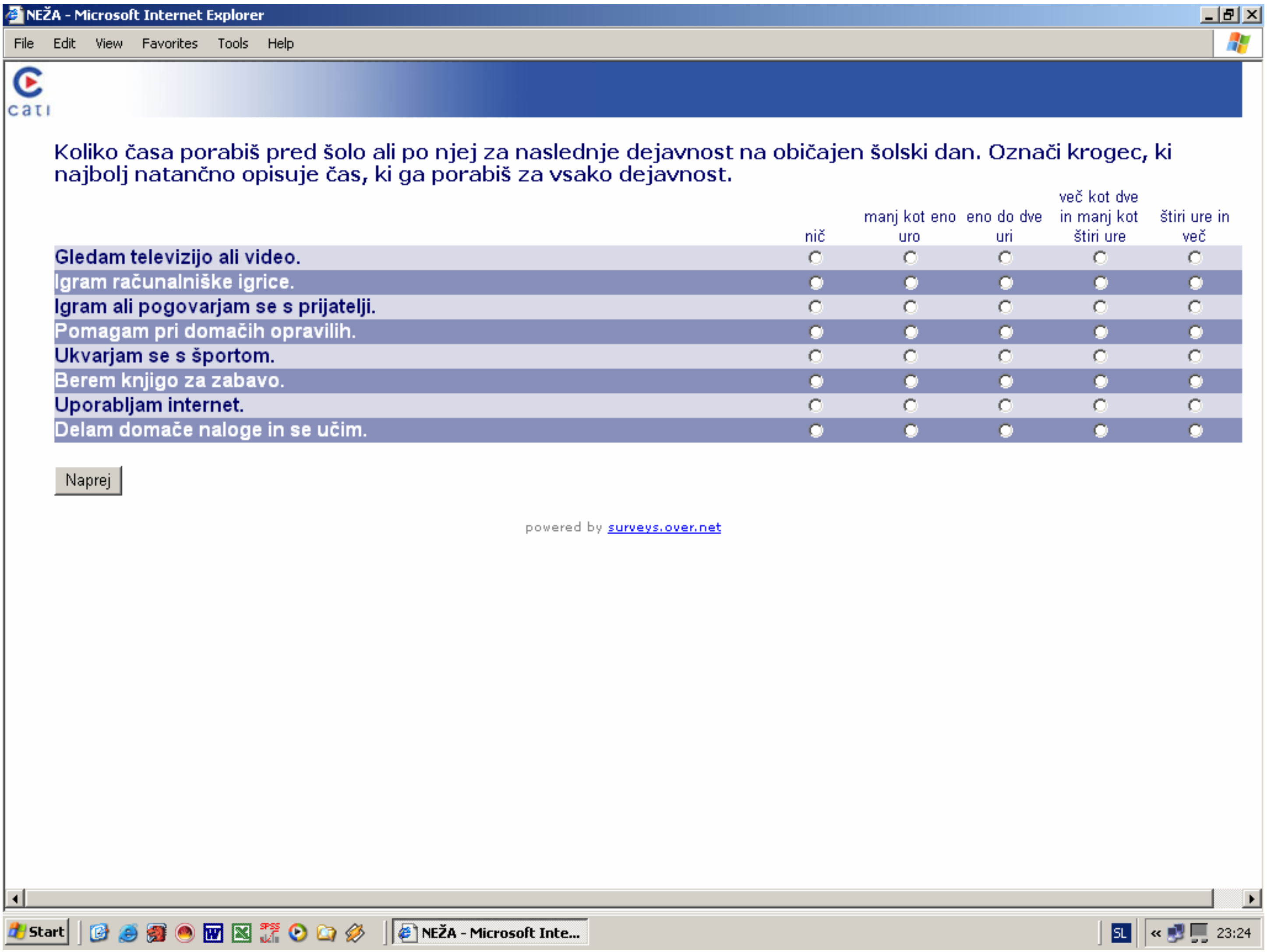
SL
23:24


NEŽA - Microsoft Internet Explorer
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cati
Koliko časa porabiš pred šolo ali po njej za naslednje dejavnost na običajen šolski dan. Označi krogec, ki najbolj natančno opisuje čas, ki ga porabiš za vsako dejavnost.
nič
manj kot eno uro
eno do dve uri
več kot dve in manj kot štiri ure
štiri ure in več
Gledam televizijo ali video.
Igram računalniške igrice.
Igram ali pogovarjam se s prijatelji.
Pomagam pri domačih opravilih.
Ukvarjam se s športom.
Berem knjigo za zabavo.
Uporabljam internet.
Delam domače naloge in se učim.
Naprej
powered by surveys.over.net
Start
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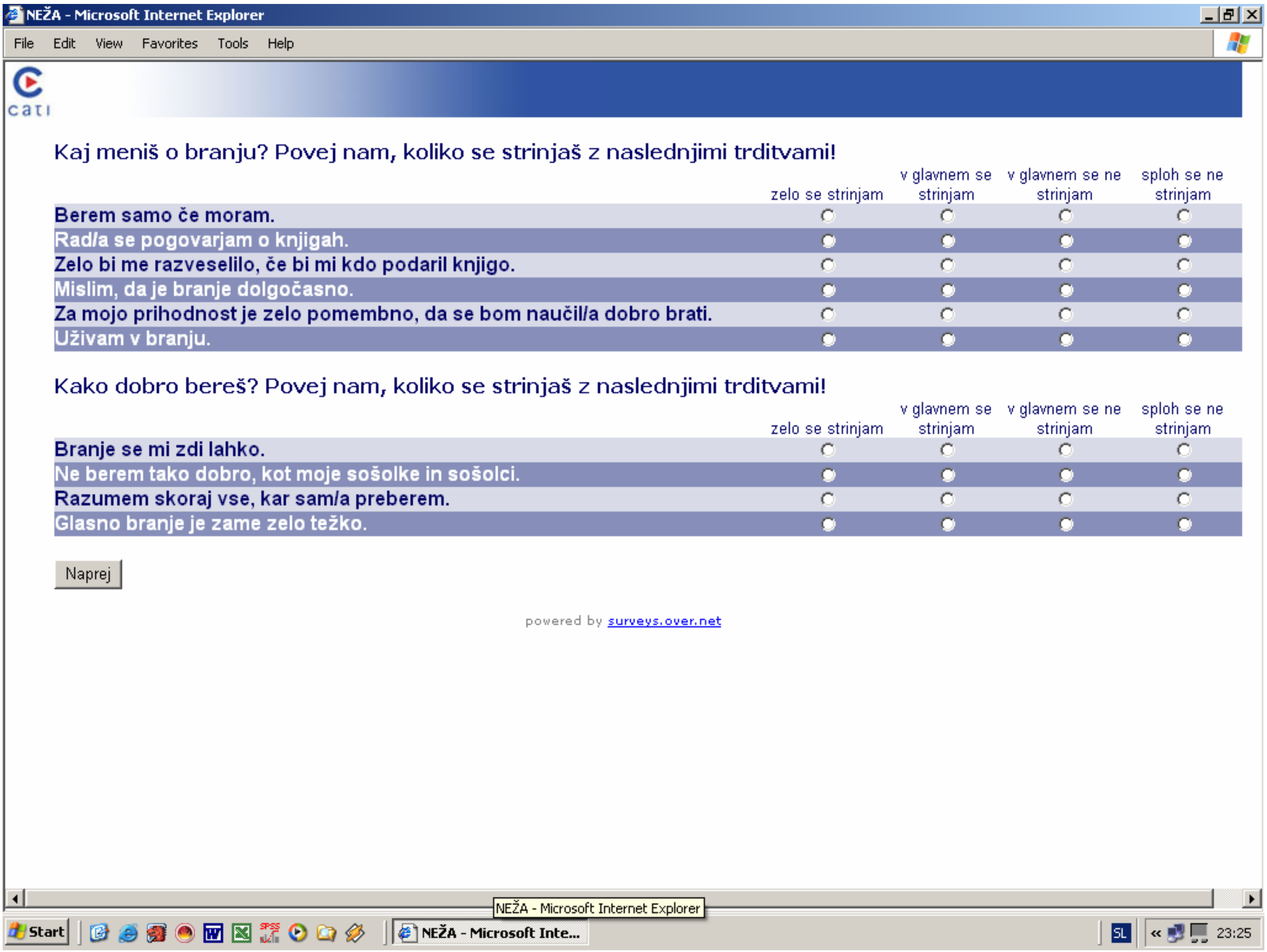
SL
23:24


NEŽA - Microsoft Internet Explorer

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cati

Kaj meniš o branju? Povej nam, koliko se strinjaš z naslednjimi trditvami!

	zelo se strinjam	v glavnem se strinjam	v glavnem se ne strinjam	sploh se ne strinjam
Berem samo če moram.				
Rad/a se pogovarjam o knjigah.				
Zelo bi me razveselilo, če bi mi kdo podaril knjigo.				
Mislim, da je branje dolgočasno.				
Za mojo prihodnost je zelo pomembno, da se bom naučil/a dobro brati.				
Uživam v branju.				

Kako dobro bereš? Povej nam, koliko se strinjaš z naslednjimi trditvami!

	zelo se strinjam	v glavnem se strinjam	v glavnem se ne strinjam	sploh se ne strinjam
Branje se mi zdi lahko.				
Ne berem tako dobro, kot moje sošolke in sošolci.				
Razumem skoraj vse, kar sam/a preberem.				
Glasno branje je zame zelo težko.				

Naprej

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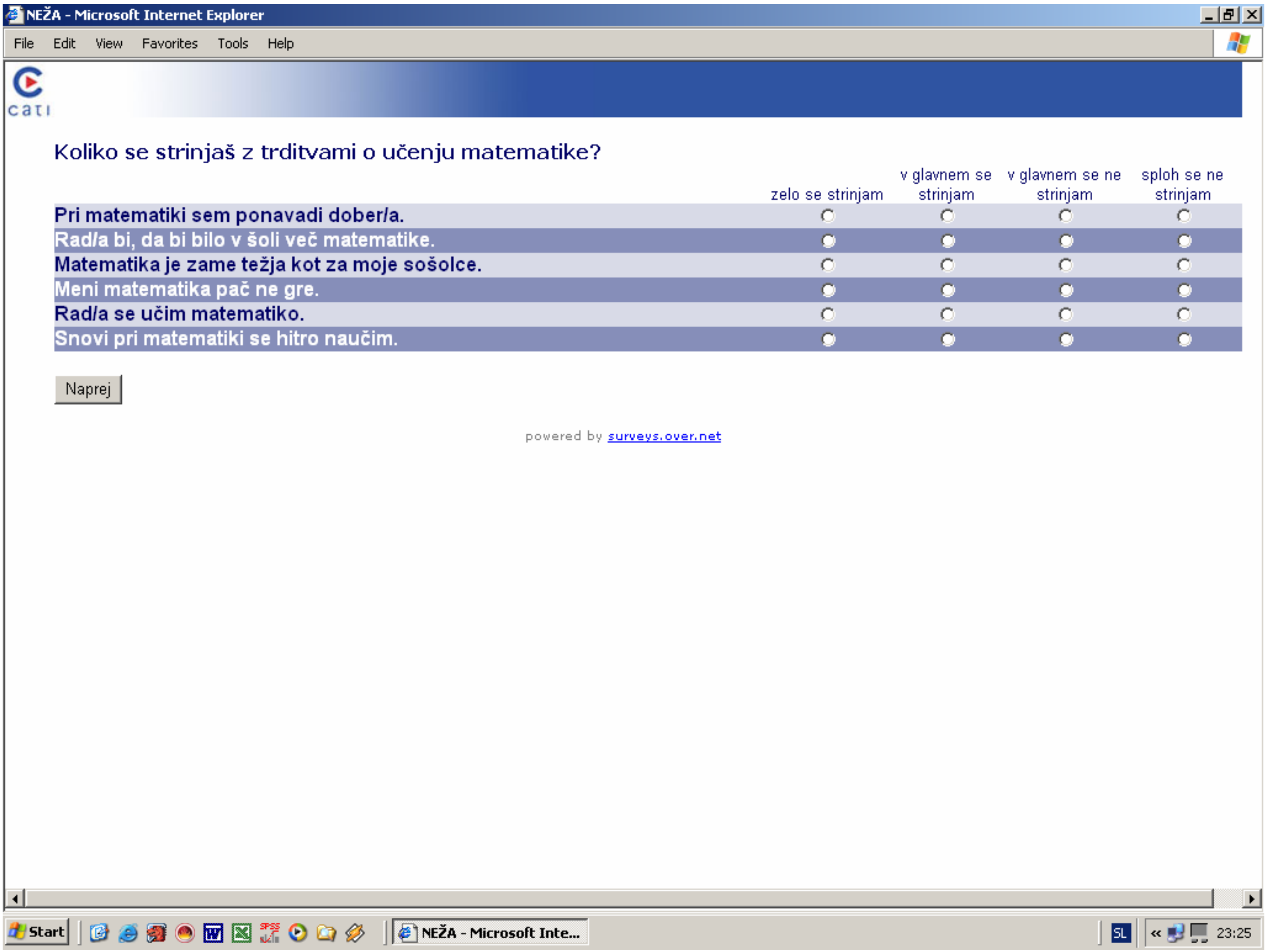
Start NEŽA - Microsoft Inte... SL 23:25


NEŽA - Microsoft Internet Explorer
File Edit View Favorites Tools Help
cati
Koliko se strinjaš z trditvami o učenju matematike?
zelo se strinjam
v glavnem se strinjam
v glavnem se ne strinjam
sploh se ne strinjam
Pri matematiki sem ponavadi dober/a.
Rad/a bi, da bi bilo v šoli več matematike.
Matematika je zame težja kot za moje sošolce.
Meni matematika pač ne gre.
Rad/a se učim matematiko.
Snovi pri matematiki se hitro naučim.
Naprej
powered by surveys.over.net
Start
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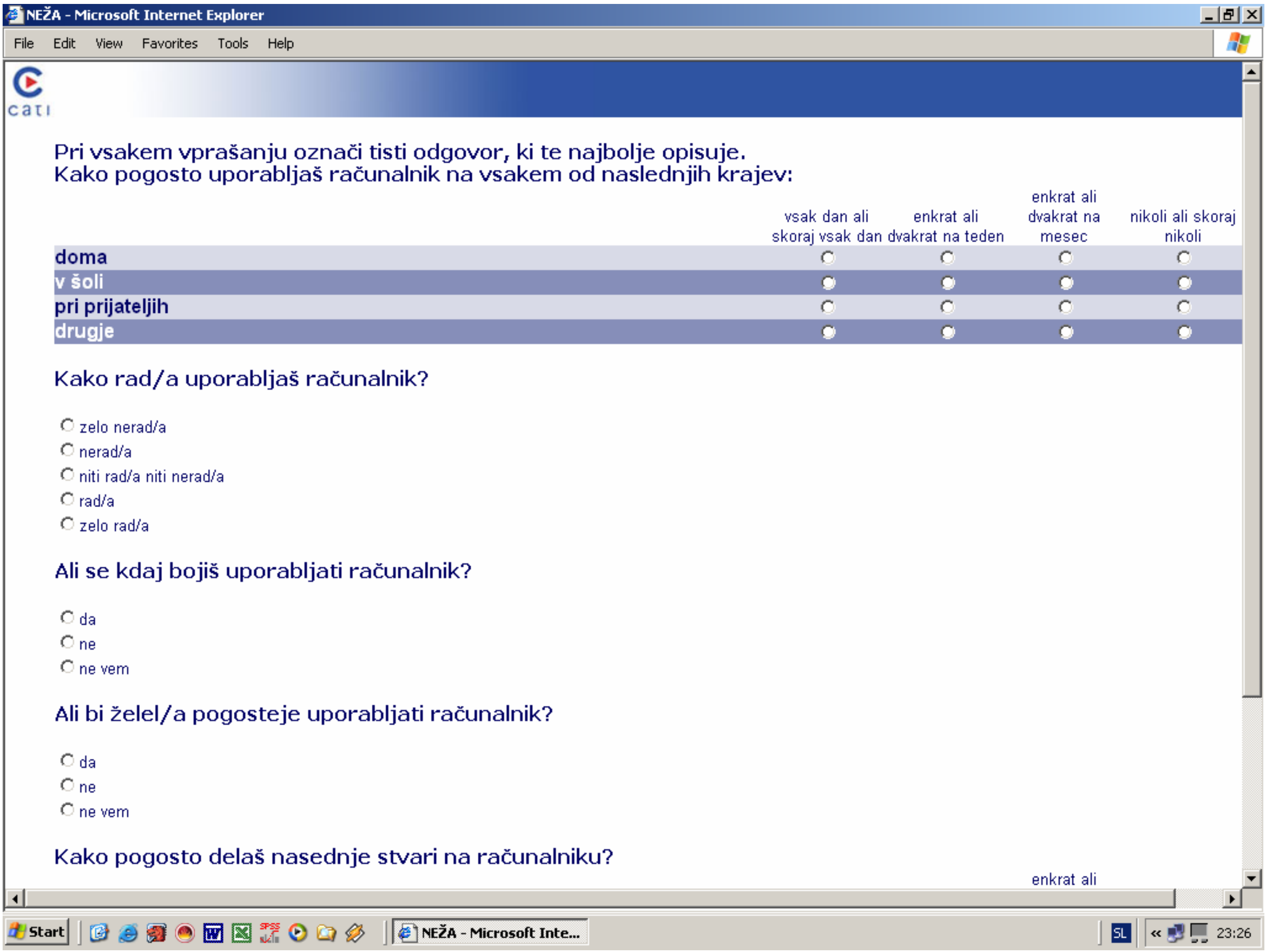
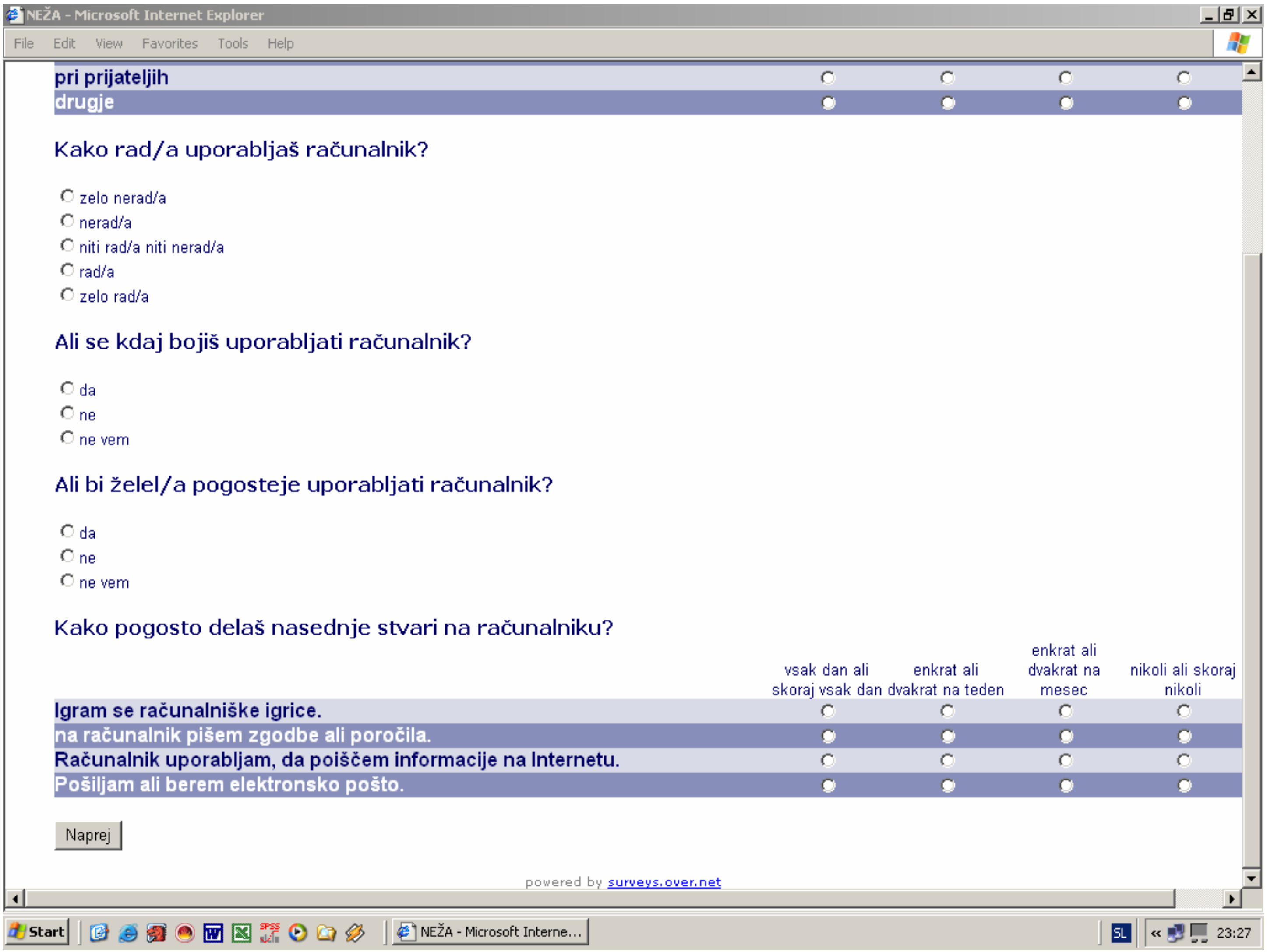

NEŽA - Microsoft Internet Explorer
File Edit View Favorites Tools Help
cati
Pri vsakem vprašanju označi tisti odgovor, ki te najbolje opisuje.
Kako pogosto uporabljaš računalnik na vsakem od naslednjih krajev:
vsak dan ali skoraj vsak dan
enkrat ali dvakrat na teden
enkrat ali dvakrat na mesec
nikoli ali skoraj nikoli
doma
v šoli
pri prijateljih
drugje
Kako rad/a uporabljaš računalnik?
zelo nerad/a
nerad/a
niti rad/a niti nerad/a
rad/a
zelo rad/a
Ali se kdaj bojiš uporabljati računalnik?
da
ne
ne vem
Ali bi želel/a pogosteje uporabljati računalnik?
da
ne
ne vem
Kako pogosto delaš nasednje stvari na računalniku?
enkrat ali
Start
NEŽA - Microsoft Inte...
SL
23:26


NEŽA - Microsoft Internet Explorer

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pri prijateljih	○	○	○	○
drugje	○	○	○	○

Kako rad/a uporabljaš računalnik?

- zelo nerad/a
- nerad/a
- niti rad/a niti nerad/a
- rad/a
- zelo rad/a

Ali se kdaj bojiš uporabljati računalnik?

- da
- ne
- ne vem

Ali bi želel/a pogosteje uporabljati računalnik?

- da
- ne
- ne vem

Kako pogosto delaš nasednje stvari na računalniku?

	vsak dan ali skoraj vsak dan	enkrat ali dvakrat na teden	enkrat ali dvakrat na mesec	nikoli ali skoraj nikoli
Igram se računalniške igrice.	○	○	○	○
na računalnik pišem zgodbe ali poročila.	○	○	○	○
Računalnik uporabljam, da poiščem informacije na Internetu.	○	○	○	○
Pošiljam ali berem elektronsko pošto.	○	○	○	○

Naprej

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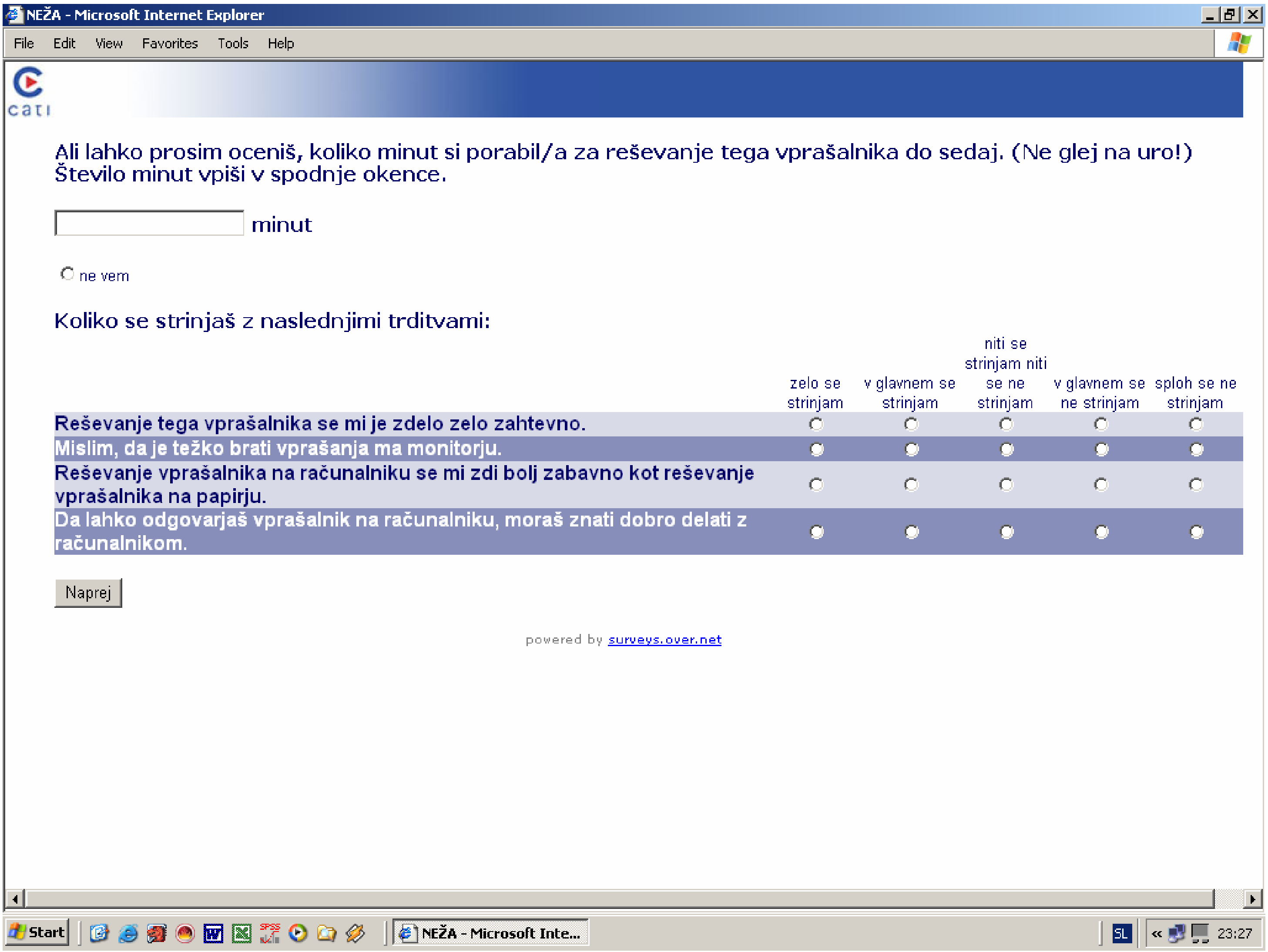
NEŽA - Microsoft Internet Explorer

File Edit View Favorites Tools Help

cati

Ali lahko prosim oceniš, koliko minut si porabil/a za reševanje tega vprašalnika do sedaj. (Ne glej na uro!) Število minut vpiši v spodnje okence.

minut

ne vem

Koliko se strinjaš z naslednjimi trditvami:

	zelo se strinjam	v glavnem se strinjam	niti se strinjam niti se ne strinjam	v glavnem se ne strinjam	sploh se ne strinjam
Reševanje tega vprašalnika se mi je zdelo zelo zahtevno.					
Mislim, da je težko brati vprašanja ma monitorju.					
Reševanje vprašalnika na računalniku se mi zdi bolj zabavno kot reševanje vprašalnika na papirju.					
Da lahko odgovarjaš vprašalnik na računalniku, moraš znati dobro delati z računalnikom.					

Naprej

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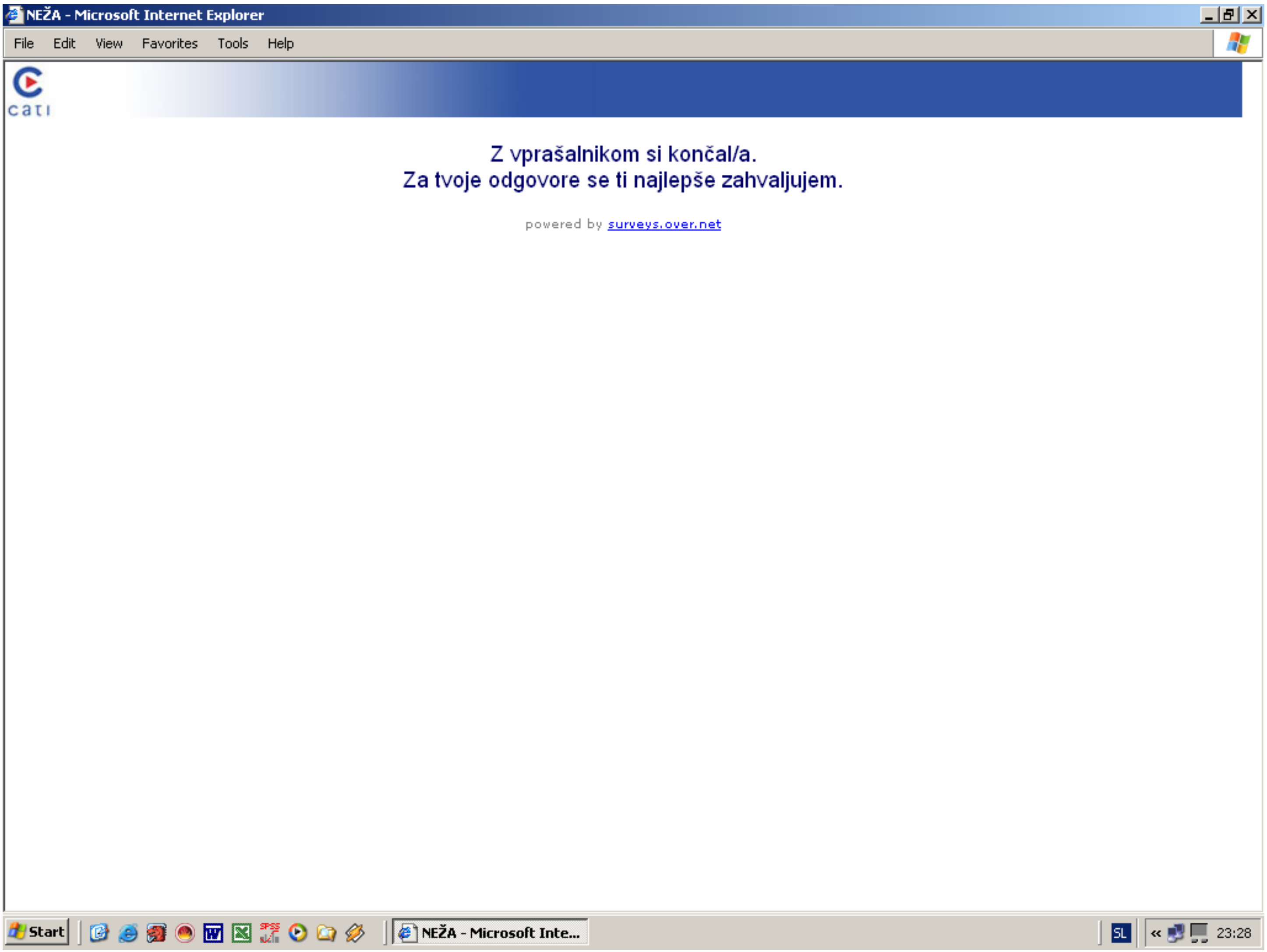
Start NEŽA - Microsoft Inte... SL 23:27


NEŽA - Microsoft Internet Explorer
File Edit View Favorites Tools Help
cati
Z vprašalnikom si končal/a.
Za tvoje odgovore se ti najlepše zahvaljujem.
powered by surveys.over.net
Start
NEŽA - Microsoft Inte...
SL
23:28

C. Structural equation modeling

Merged database for attitudes towards reading

DATE: 12/ 3/2004
TIME: 9:45

L I S R E L 8.54

BY

Karl G. J”reskog & Dag S”rbom

The following lines were read from file merged.lis:

```
TI Project: c:\dokum. Categorization variable: baza    . Group: merged
TI zdruzena baza casaq, papi faktorska
TI complete set of data
DA NI=6 NO=2928 NG=1 MA=CM
LA
'AS_MUST' 'AS_TALK' 'AS_PRES' 'AS_BORI' 'AS_FUTR' 'AS_ENJOY'
RA FI=compl1.raw
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
LE
'attit1' 'attit2'
VA 1.000 LY(2,1) LY(4,2)
FR LY(1,2) LY(3,1) LY(5,1) LY(6,1)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,4) TE(5,5)
FR TE(6,4) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
OU ME=ML AD=OFF IT=9999 XM FM LY=merged.est C
PS=merged.est TE=merged.est TY=merged.est C
AL=merged.est  GF=merged.gft C
PV=merged.pvt C
SV=merged.svt
```

TI Project: c:\dokum. Categorization variable: baza . Group: merged

Number of Input Variables 6
Number of Y - Variables 6
Number of X - Variables 0
Number of ETA - Variables 2
Number of KSI - Variables 0
Number of Observations 2928

TI Project: c:\dokum. Categorization variable: baza . Group: merged

Covariance Matrix

```
 AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
--------   --------   --------   --------   --------   --------
```

AS_MUST	1.58					
AS_TALK	0.10	1.08				
AS_PRES	0.10	0.35	0.69			
AS_BORI	0.41	0.30	0.27	1.13		
AS_FUTR	0.03	0.14	0.14	0.11	0.32	
AS_ENJOY	0.25	0.45	0.37	0.48	0.16	0.85

Means

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
2.50	2.05	1.48	1.66	1.18	1.60

TI Project: c:\dokum. Categorization variable: baza . Group: merged

Parameter Specifications

LAMBDA-Y

	attit1	attit2
AS_MUST	0	1
AS_TALK	0	0
AS_PRES	2	0
AS_BORI	0	0
AS_FUTR	3	0
AS_ENJOY	4	0

PSI

	attit1	attit2
attit1	5	
attit2	6	7

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	8					
AS_TALK	0	9				
AS_PRES	0	0	10			
AS_BORI	0	0	0	11		
AS_FUTR	0	0	0	0	12	
AS_ENJOY	0	0	0	13	0	14

TAU-Y

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
15	16	17	18	19	20

TI Project: c:\dokum. Categorization variable: baza . Group: merged

Number of Iterations = 13

LISREL Estimates (Maximum Likelihood)

LAMBDA-Y

	attit1	attit2
AS_MUST	- -	0.51
	(0.05)	
	9.54	
AS_TALK	1.00	- -

```
 AS_PRES      0.87       - -
           (0.04)
            24.61

 AS_BORI       - -      1.00

 AS_FUTR      0.38       - -
           (0.02)
            17.80

AS_ENJOY      1.11       - -
           (0.04)
            24.84


      Covariance Matrix of ETA

           attit1    attit2
          --------  --------
 attit1      0.40
 attit2      0.32      0.76

      PSI

           attit1    attit2
          --------  --------
 attit1      0.40
           (0.03)
            15.36

 attit2      0.32      0.76
           (0.02)    (0.08)
            17.19      9.97


      THETA-EPS

          AS_MUST   AS_TALK   AS_PRES   AS_BORI   AS_FUTR  AS_ENJOY
          --------  --------  --------  --------  --------  --------
 AS_MUST      1.39
           (0.04)
            33.55

 AS_TALK       - -      0.68
                     (0.02)
                      30.10

 AS_PRES       - -       - -      0.40
                               (0.01)
                                27.46

 AS_BORI       - -       - -       - -      0.35
                                         (0.07)
                                           4.86

 AS_FUTR       - -       - -       - -       - -      0.27
                                                   (0.01)
                                                    35.53

AS_ENJOY       - -       - -       - -      0.12       - -      0.36
                                         (0.02)              (0.02)
                                           7.23               19.18


      Squared Multiple Correlations for Y - Variables

          AS_MUST   AS_TALK   AS_PRES   AS_BORI   AS_FUTR  AS_ENJOY
          --------  --------  --------  --------  --------  --------
             0.12      0.37      0.43      0.68      0.17      0.58

      TAU-Y
```

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
2.50	2.05	1.48	1.66	1.18	1.60
(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
107.75	106.84	95.94	85.13	112.16	93.99

LY was written to file merged.est

PS was written to file merged.est

TE was written to file merged.est

TY was written to file merged.est

AL was written to file merged.est

Goodness of Fit Statistics

Degrees of Freedom = 7
Minimum Fit Function Chi-Square = 64.34 (P = 0.00)
Normal Theory Weighted Least Squares Chi-Square = 65.30 (P = 0.00)
Estimated Non-centrality Parameter (NCP) = 58.30
90 Percent Confidence Interval for NCP = (36.07 ; 88.00)

Minimum Fit Function Value = 0.022
Population Discrepancy Function Value (F0) = 0.020
90 Percent Confidence Interval for F0 = (0.012 ; 0.030)
Root Mean Square Error of Approximation (RMSEA) = 0.053
90 Percent Confidence Interval for RMSEA = (0.042 ; 0.066)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.30

Expected Cross-Validation Index (ECVI) = 0.036
90 Percent Confidence Interval for ECVI = (0.026 ; 0.044)
ECVI for Saturated Model = 0.014
ECVI for Independence Model = 1.47

Chi-Square for Independence Model with 15 Degrees of Freedom = 4302.26
Independence AIC = 4314.26
Model AIC = 105.30
Saturated AIC = 42.00
Independence CAIC = 4356.15
Model CAIC = 244.94
Saturated CAIC = 188.62

Normed Fit Index (NFI) = 0.99
Non-Normed Fit Index (NNFI) = 0.97
Parsimony Normed Fit Index (PNFI) = 0.46
Comparative Fit Index (CFI) = 0.99
Incremental Fit Index (IFI) = 0.99
Relative Fit Index (RFI) = 0.97

Critical N (CN) = 841.47

Root Mean Square Residual (RMR) = 0.025
Standardized RMR = 0.024
Goodness of Fit Index (GFI) = 0.99
Adjusted Goodness of Fit Index (AGFI) = 0.98
Parsimony Goodness of Fit Index (PGFI) = 0.33

Time used: 0.130 Seconds

Two groups (attitudes towards reading) - fully constrained model

```
                DATE: 12/ 3/2004
          TIME:  9:58


         L I S R E L  8.54

             BY

     Karl G. J”reskog & Dag S”rbom



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The following lines were read from file differ_mode.lis:

TI Project: c:\dokum. Categorization variable: papi    . Group: casaq
TI title
TI complete set of data
DA NI=6 NO=121 NG=2 MA=CM
LA
'AS_MUST' 'AS_TALK' 'AS_PRES' 'AS_BORI' 'AS_FUTR' 'AS_ENJOY'
RA FI=compl1.raw
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
LE
'must_r' 'enjoy_r'
VA 1.000 LY(1,1) LY(2,2)
FR LY(3,2) LY(4,1) LY(5,2) LY(6,2)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,4) TE(5,5)
FR TE(6,4) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6 FM C
LY=differ_mode.est PS=differ_mode.est C
TE=differ_mode.est TY=differ_mode.est C
AL=differ_mode.est  GF=differ_mode.gft C
PV=differ_mode.pvt C
SV=differ_mode.svt

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

             Number of Input Variables  6
             Number of Y - Variables    6
             Number of X - Variables    0
             Number of ETA - Variables  2
             Number of KSI - Variables  0
             Number of Observations   121
             Number of Groups           2

TI Project: c:\dokum. Categorization variable: papi    . Group: papi
TI title
TI complete set of data
DA NI=6 NO=2807 NG=2 MA=CM
LA
'AS_MUST' 'AS_TALK' 'AS_PRES' 'AS_BORI' 'AS_FUTR' 'AS_ENJOY'
RA FI=compl2.raw
```

```
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
LE
'must_r' 'enjoy_r'
VA 1.000 LY(1,1) LY(2,2)
FR LY(3,2) LY(4,1) LY(5,2) LY(6,2)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,4) TE(5,5)
FR TE(6,4) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
EQ LY(2,3,2) LY(1,3,2)
EQ LY(2,4,1) LY(1,4,1)
EQ LY(2,5,2) LY(1,5,2)
EQ LY(2,6,2) LY(1,6,2)
EQ PS(2,1,1) PS(1,1,1)
EQ PS(2,2,1) PS(1,2,1)
EQ PS(2,2,2) PS(1,2,2)
EQ TE(2,1,1) TE(1,1,1)
EQ TE(2,2,2) TE(1,2,2)
EQ TE(2,3,3) TE(1,3,3)
EQ TE(2,4,4) TE(1,4,4)
EQ TE(2,5,5) TE(1,5,5)
EQ TE(2,6,4) TE(1,6,4)
EQ TE(2,6,6) TE(1,6,6)
EQ TY(2,1) TY(1,1)
EQ TY(2,2) TY(1,2)
EQ TY(2,3) TY(1,3)
EQ TY(2,4) TY(1,4)
EQ TY(2,5) TY(1,5)
EQ TY(2,6) TY(1,6)
OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6  ND=6 FM C
LY=differ_mode.est PS=differ_mode.est C
TE=differ_mode.est TY=differ_mode.est C
AL=differ_mode.est  GF=differ_mode.gft C
PV=differ_mode.pvt C
SV=differ_mode.svt

TI Project: c:\dokum. Categorization variable: papi    . Group: papi

              Number of Input Variables  6
              Number of Y - Variables    6
              Number of X - Variables    0
              Number of ETA - Variables  2
              Number of KSI - Variables  0
              Number of Observations  2807
              Number of Groups           2

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

   Covariance Matrix

           AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
          --------   --------   --------   --------   --------   --------
 AS_MUST   1.518320
 AS_TALK   0.089394   1.133333
 AS_PRES   0.149380   0.439394   0.663774
 AS_BORI   0.301791   0.295455   0.255579   1.117218
 AS_FUTR   0.027893   0.252273   0.321832   0.173967   0.642562
AS_ENJOY   0.319146   0.542424   0.486570   0.544353   0.346006   0.920386

   Means

           AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
          --------   --------   --------   --------   --------   --------
          2.479339   2.090909   1.570248   1.685950   1.338843   1.719008



TI Project: c:\dokum. Categorization variable: papi    . Group: papi
```

Covariance Matrix

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	1.585051					
AS_TALK	0.103614	1.073083				
AS_PRES	0.093793	0.349921	0.695590			
AS_BORI	0.416451	0.299171	0.267723	1.127293		
AS_FUTR	0.028381	0.134576	0.136583	0.112304	0.309518	
AS_ENJOY	0.247548	0.442176	0.369393	0.482011	0.153726	0.849008

Means

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
2.505878	2.045957	1.473815	1.662985	1.173495	1.598860

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Parameter Specifications

LAMBDA-Y EQUALS LAMBDA-Y IN THE FOLLOWING GROUP

PSI EQUALS PSI IN THE FOLLOWING GROUP

THETA-EPS EQUALS THETA-EPS IN THE FOLLOWING GROUP

TAU-Y EQUALS TAU-Y IN THE FOLLOWING GROUP

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Parameter Specifications

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0	0
AS_TALK	0	0
AS_PRES	0	1
AS_BORI	2	0
AS_FUTR	0	3
AS_ENJOY	0	4

PSI

	must_r	enjoy_r
must_r	5	
enjoy_r	6	7

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	8					
AS_TALK	0	9				
AS_PRES	0	0	10			
AS_BORI	0	0	0	11		
AS_FUTR	0	0	0	0	12	
AS_ENJOY	0	0	0	13	0	14

TAU-Y

AS_MUST AS_TALK AS_PRES AS_BORI AS_FUTR AS_ENJOY

```
        --------  --------  --------  --------  --------  --------
              15        16        17        18        19        20
```

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Number of Iterations = 18

LISREL Estimates (Maximum Likelihood)

LAMBDA-Y EQUALS LAMBDA-Y IN THE FOLLOWING GROUP

Covariance Matrix of ETA

```
            must_r    enjoy_r
          --------   --------
  must_r   0.196564
 enjoy_r   0.160309   0.397449
```

PSI EQUALS PSI IN THE FOLLOWING GROUP

THETA-EPS EQUALS THETA-EPS IN THE FOLLOWING GROUP

TAU-Y EQUALS TAU-Y IN THE FOLLOWING GROUP

LY was written to file differ_mode.est

PS was written to file differ_mode.est

TE was written to file differ_mode.est

TY was written to file differ_mode.est

AL was written to file differ_mode.est

Group Goodness of Fit Statistics

Contribution to Chi-Square = 67.617898
Percentage Contribution to Chi-Square = 52.286058

Root Mean Square Residual (RMR) = 0.120156
Standardized RMR = 0.275209
Goodness of Fit Index (GFI) = 0.824662

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

```
            must_r    enjoy_r
          --------   --------
 AS_MUST   0.766448   0.003290
 AS_TALK   0.485388   0.018740
 AS_PRES   0.470754   0.010013
 AS_BORI   0.297593   0.954241
 AS_FUTR   3.781776  30.878967
AS_ENJOY   2.462324   0.326327
```

Expected Change for LAMBDA-Y

```
            must_r    enjoy_r
          --------   --------
```

AS_MUST	-0.258496	0.011743
AS_TALK	-0.151813	-0.020239
AS_PRES	-0.117175	0.011022
AS_BORI	-0.092573	-0.148151
AS_FUTR	0.253099	0.479042
AS_ENJOY	0.269759	0.060922

Standardized Expected Change for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	-0.114606	0.007403
AS_TALK	-0.067307	-0.012759
AS_PRES	-0.051950	0.006949
AS_BORI	-0.041043	-0.093400
AS_FUTR	0.112213	0.302005
AS_ENJOY	0.119599	0.038407

Completely Standardized Expected Change for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	-0.091108	0.005885
AS_TALK	-0.064898	-0.012303
AS_PRES	-0.062331	0.008337
AS_BORI	-0.038805	-0.088307
AS_FUTR	0.197061	0.530363
AS_ENJOY	0.129533	0.041597

Modification Indices for PSI

	must_r	enjoy_r
must_r	0.184768	
enjoy_r	0.221241	4.685461

Expected Change for PSI

	must_r	enjoy_r
must_r	-0.011586	
enjoy_r	-0.011210	0.112265

Standardized Expected Change for PSI

	must_r	enjoy_r
must_r	-0.058942	
enjoy_r	-0.040108	0.282463

Modification Indices for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.002123					
AS_TALK	0.884275	0.014109				
AS_PRES	0.002754	0.688307	4.460044			
AS_BORI	1.371946	0.189778	0.960751	0.049772		
AS_FUTR	2.148483	2.548477	5.431938	1.237934	50.572210	
AS_ENJOY	3.881463	0.234852	1.510412	0.594337	0.369386	1.957677

Expected Change for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.008406					

AS_TALK	-0.092003	-0.011919				
AS_PRES	0.004027	0.046848	-0.130257			
AS_BORI	-0.113618	-0.031735	-0.056062	0.022420		
AS_FUTR	-0.085524	-0.068981	0.078938	-0.048236	0.254283	
AS_ENJOY	0.151351	0.026857	0.052876	0.040374	0.020436	-0.085550

Completely Standardized Expected Change for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.005312					
AS_TALK	-0.070521	-0.011081				
AS_PRES	0.003841	0.054197	-0.187514			
AS_BORI	-0.085397	-0.028930	-0.063596	0.020042		
AS_FUTR	-0.119397	-0.116804	0.166327	-0.080090	0.784214	
AS_ENJOY	0.130313	0.028046	0.068712	0.041343	0.038870	-0.100351

Modification Indices for TAU-Y

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
0.158022	0.330154	0.176316	0.276287	8.024512	0.420859

Expected Change for TAU-Y

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
-0.042689	-0.045762	0.026219	-0.041895	0.134676	0.040331

Modification Indices for ALPHA

must_r	enjoy_r
0.475792	3.489131

Expected Change for ALPHA

must_r	enjoy_r
-0.029690	0.111527

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Covariances

Y - ETA

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
must_r	0.196564	0.160309	0.138724	0.387750	0.060241	0.178636
enjoy_r	0.160309	0.397449	0.343934	0.316232	0.149353	0.442885

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Factor Scores Regressions

ETA

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
must_r	0.039691	0.037960	0.056111	0.315331	0.036080	-0.025492
enjoy_r	0.018577	0.145565	0.215170	0.044673	0.138355	0.291500

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Within Group Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
	--------	--------
AS_MUST	0.443356	- -
AS_TALK	- -	0.630436
AS_PRES	- -	0.545550
AS_BORI	0.874581	- -
AS_FUTR	- -	0.236904
AS_ENJOY	- -	0.702506

Correlation Matrix of ETA

	must_r	enjoy_r
	--------	--------
must_r	1.000000	
enjoy_r	0.573543	1.000000

PSI

	must_r	enjoy_r
	--------	--------
must_r	1.000000	
enjoy_r	0.573543	1.000000

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Within Group Completely Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
	--------	--------
AS_MUST	0.352454	- -
AS_TALK	- -	0.607867
AS_PRES	- -	0.654563
AS_BORI	0.826888	- -
AS_FUTR	- -	0.416036
AS_ENJOY	- -	0.760855

Correlation Matrix of ETA

	must_r	enjoy_r
	--------	--------
must_r	1.000000	
enjoy_r	0.573543	1.000000

PSI

	must_r	enjoy_r
	--------	--------
must_r	1.000000	
enjoy_r	0.573543	1.000000

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
	--------	--------	--------	--------	--------	--------
AS_MUST	0.875776					
AS_TALK	- -	0.630498				
AS_PRES	- -	- -	0.571547			
AS_BORI	- -	- -	- -	0.316256		
AS_FUTR	- -	- -	- -	- -	0.826914	
AS_ENJOY	- -	- -	- -	0.122875	- -	0.421100

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Standardized Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Number of Iterations = 18

LISREL Estimates (Maximum Likelihood)

```
       LAMBDA-Y

           must_r    enjoy_r
          --------   --------
 AS_MUST   1.000000    - -

 AS_TALK    - -       1.000000

 AS_PRES    - -       0.865354
                     (0.035171)
                      24.604478

 AS_BORI   1.972639    - -
          (0.206827)
           9.537607

 AS_FUTR    - -       0.375778
                     (0.021111)
                      17.800493

AS_ENJOY    - -       1.114318
                     (0.044869)
                      24.834971


       Covariance Matrix of ETA

           must_r    enjoy_r
          --------   --------
 must_r   0.196564
 enjoy_r  0.160309   0.397449

       PSI

           must_r    enjoy_r
          --------   --------
 must_r   0.196564
          (0.028151)
           6.982576

 enjoy_r  0.160309   0.397449
          (0.017824) (0.025881)
           8.994108  15.356668


       THETA-EPS

          AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
          --------   --------   --------   --------   --------   --------
 AS_MUST   1.385778
          (0.041307)
           33.547899

 AS_TALK    - -       0.678185
                     (0.022534)
                      30.096712

 AS_PRES    - -        - -       0.397026
                                (0.014460)
                                 27.456021

 AS_BORI    - -        - -        - -       0.353789
                                           (0.072749)
```

4.863151

```
AS_FUTR   - -      - -      - -      - -     0.268129
                                           (0.007548)
                                            35.521851

AS_ENJOY   - -      - -      - -     0.119996   - -     0.358989
                                (0.016593)         (0.018721)
                                 7.231644           19.175380
```

Squared Multiple Correlations for Y - Variables

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
0.124224	0.369502	0.428453	0.683744	0.173086	0.578900

TAU-Y

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
2.504790	2.047800	1.477770	1.663927	1.180276	1.603787
(0.023255)	(0.019173)	(0.015408)	(0.019553)	(0.010527)	(0.017069)
107.710556	106.805233	95.909317	85.097842	112.119032	93.958489

LY was written to file differ_mode.est

PS was written to file differ_mode.est

TE was written to file differ_mode.est

TY was written to file differ_mode.est

AL was written to file differ_mode.est

Global Goodness of Fit Statistics

Degrees of Freedom = 34
Minimum Fit Function Chi-Square = 129.322997 (P = 0.00)
Normal Theory Weighted Least Squares Chi-Square = 163.010702 (P = 0.0)
Estimated Non-centrality Parameter (NCP) = 129.010702
90 Percent Confidence Interval for NCP = (92.963768 ; 172.595017)

Minimum Fit Function Value = 0.0441979
Population Discrepancy Function Value (F0) = 0.0440911
90 Percent Confidence Interval for F0 = (0.0317716 ; 0.0589867)
Root Mean Square Error of Approximation (RMSEA) = 0.0509274
90 Percent Confidence Interval for RMSEA = (0.0432310 ; 0.0589050)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.172157

Expected Cross-Validation Index (ECVI) = 0.0693816
90 Percent Confidence Interval for ECVI = (0.0529610 ; 0.0801760)
ECVI for Saturated Model = 0.0143541
ECVI for Independence Model = 1.474669

Chi-Square for Independence Model with 30 Degrees of Freedom = 4302.882176
Independence AIC = 4326.882176
Model AIC = 203.010702
Saturated AIC = 84.000000
Independence CAIC = 4410.667074
Model CAIC = 342.652200
Saturated CAIC = 377.247145

Normed Fit Index (NFI) = 0.969945
Non-Normed Fit Index (NNFI) = 0.980316
Parsimony Normed Fit Index (PNFI) = 1.099271
Comparative Fit Index (CFI) = 0.977691
Incremental Fit Index (IFI) = 0.977670
Relative Fit Index (RFI) = 0.973481

Critical N (CN) = 1269.415225

Group Goodness of Fit Statistics

Contribution to Chi-Square = 61.705099
Percentage Contribution to Chi-Square = 47.713942

Root Mean Square Residual (RMR) = 0.0251283
Standardized RMR = 0.0259565
Goodness of Fit Index (GFI) = 0.992593

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.766447	0.003290
AS_TALK	3.898448	0.018741
AS_PRES	0.666832	0.010014
AS_BORI	0.297592	0.954247
AS_FUTR	1.646554	30.878948
AS_ENJOY	22.650904	0.326313

Expected Change for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.258496	-0.011743
AS_TALK	-0.132128	0.020240
AS_PRES	-0.045293	-0.000471
AS_BORI	0.003959	0.148152
AS_FUTR	-0.046482	-0.020486
AS_ENJOY	0.543449	-0.002605

Standardized Expected Change for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.114606	-0.007403
AS_TALK	-0.058580	0.012760
AS_PRES	-0.020081	-0.000297
AS_BORI	0.001755	0.093400
AS_FUTR	-0.020608	-0.012915
AS_ENJOY	0.240941	-0.001642

Completely Standardized Expected Change for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.091108	-0.005885
AS_TALK	-0.056483	0.012303
AS_PRES	-0.024093	-0.000357
AS_BORI	0.001659	0.088307
AS_FUTR	-0.036190	-0.022681
AS_ENJOY	0.260954	-0.001779

Modification Indices for PSI

	must_r	enjoy_r
must_r	0.184765	
enjoy_r	0.221245	4.685434

Expected Change for PSI

	must_r	enjoy_r
must_r	0.000495	
enjoy_r	0.000479	-0.004801

Standardized Expected Change for PSI

	must_r	enjoy_r
must_r	0.002521	
enjoy_r	0.001715	-0.012080

Modification Indices for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.002123					
AS_TALK	9.424534	0.014108				
AS_PRES	13.075614	2.863880	4.460020			
AS_BORI	1.371946	0.527148	0.623556	0.049773		
AS_FUTR	6.758519	1.342678	8.179927	0.401728	50.572213	
AS_ENJOY	49.101142	0.904738	12.302986	0.594342	1.712518	1.957677

Expected Change for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	-0.000359					
AS_TALK	-0.064878	0.000510				
AS_PRES	-0.060951	0.031098	0.005570			
AS_BORI	0.113618	-0.012798	0.011651	-0.000959		
AS_FUTR	-0.031804	-0.011335	0.022786	0.005960	-0.010875	
AS_ENJOY	0.136566	0.017924	-0.056634	-0.001727	-0.011075	0.003659

Completely Standardized Expected Change for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	-0.000227					
AS_TALK	-0.049730	0.000474				
AS_PRES	-0.058136	0.035976	0.008019			
AS_BORI	0.085397	-0.011667	0.013217	-0.000857		
AS_FUTR	-0.044401	-0.019193	0.048011	0.009895	-0.033537	
AS_ENJOY	0.117583	0.018718	-0.073595	-0.001768	-0.021064	0.004292

Modification Indices for TAU-Y

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
0.158024	0.330156	0.176314	0.276289	8.024535	0.420863

Expected Change for TAU-Y

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
0.001826	0.001957	-0.001121	0.001792	-0.005760	-0.001725

Modification Indices for ALPHA

must_r	enjoy_r
0.475796	3.489137

Expected Change for ALPHA

must_r	enjoy_r
0.029690	-0.111527

Max. Mod. Index is 50.57 for Element (5, 5) of THETA-EPS in Group 2

Covariance Matrix of Parameter Estimates

	LY 3,2	LY 4,1	LY 5,2	LY 6,2	PS 1,1	PS 2,1
LY 3,2	0.001237					
LY 4,1	-0.000034	0.042778				
LY 5,2	0.000292	0.000020	0.000446			
LY 6,2	0.000845	0.000980	0.000388	0.002013		
PS 1,1	0.000003	-0.005275	-0.000002	-0.000079	0.000792	
PS 2,1	-0.000125	-0.003158	-0.000054	-0.000188	0.000425	0.000318
PS 2,2	-0.000619	-0.000144	-0.000267	-0.000882	0.000029	0.000156
TE 1,1	-0.000003	0.003406	0.000002	0.000079	-0.000394	-0.000251
TE 2,2	0.000218	0.000144	0.000093	0.000366	-0.000012	-0.000038
TE 3,3	-0.000153	0.000131	-0.000001	0.000079	-0.000011	0.000002
TE 4,4	0.000015	-0.012266	-0.000009	-0.000382	0.001117	0.000888
TE 5,5	0.000000	0.000014	-0.000026	0.000009	-0.000001	0.000000
TE 6,4	0.000013	-0.000736	-0.000008	-0.000243	0.000070	0.000016
TE 6,6	0.000020	-0.000462	-0.000011	-0.000414	0.000040	0.000027
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,4	TE 5,5
PS 2,2	0.000670					
TE 1,1	-0.000012	0.001706				
TE 2,2	-0.000193	0.000012	0.000508			
TE 3,3	0.000005	0.000011	-0.000005	0.000209		
TE 4,4	0.000065	-0.001117	-0.000065	-0.000059	0.005292	
TE 5,5	0.000001	0.000001	-0.000001	0.000000	-0.000007	0.000057
TE 6,4	0.000055	-0.000070	-0.000055	-0.000050	0.000364	-0.000006
TE 6,6	0.000084	-0.000040	-0.000084	-0.000076	0.000209	-0.000008
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TE 6,4	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 6,4	0.000275					
TE 6,6	0.000176	0.000350				
TY 1	- -	- -	0.000541			
TY 2	- -	- -	0.000055	0.000368		
TY 3	- -	- -	0.000047	0.000118	0.000237	
TY 4	- -	- -	0.000133	0.000108	0.000094	0.000382
TY 5	- -	- -	0.000021	0.000051	0.000044	0.000041
TY 6	- -	- -	0.000061	0.000151	0.000131	0.000161

Covariance Matrix of Parameter Estimates

	TY 5	TY 6
TY 5	0.000111	
TY 6	0.000057	0.000291

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Correlation Matrix of Parameter Estimates

LY 3,2	LY 4,1	LY 5,2	LY 6,2	PS 1,1	PS 2,1

LY 3,2	1.000000					
LY 4,1	-0.004624	1.000000				
LY 5,2	0.393409	0.004511	1.000000			
LY 6,2	0.535648	0.105610	0.409455	1.000000		
PS 1,1	0.002733	-0.905951	-0.002667	-0.062191	1.000000	
PS 2,1	-0.199442	-0.856554	-0.142965	-0.235622	0.846497	1.000000
PS 2,2	-0.679776	-0.026937	-0.489453	-0.759945	0.040033	0.337856
TE 1,1	-0.001863	0.398692	0.001817	0.042382	-0.338547	-0.341383
TE 2,2	0.274605	0.030939	0.195978	0.361942	-0.018288	-0.094589
TE 3,3	-0.300199	0.043839	-0.002188	0.122373	-0.025914	0.007387
TE 4,4	0.005909	-0.815176	-0.005765	-0.116986	0.545529	0.685103
TE 5,5	0.000474	0.009273	-0.166222	0.025885	-0.005481	0.001563
TE 6,4	0.022055	-0.214589	-0.021517	-0.326853	0.149460	0.054444
TE 6,6	0.029768	-0.119439	-0.029041	-0.492878	0.075942	0.082303
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,4	TE 5,5
PS 2,2	1.000000					
TE 1,1	-0.010851	1.000000				
TE 2,2	-0.331590	0.012463	1.000000			
TE 3,3	0.013063	0.017660	-0.015004	1.000000		
TE 4,4	0.034420	-0.371773	-0.039533	-0.056018	1.000000	
TE 5,5	0.002763	0.003736	-0.003174	-0.004497	-0.011849	1.000000
TE 6,4	0.128473	-0.101856	-0.147560	-0.209088	0.301951	-0.044228
TE 6,6	0.173402	-0.051754	-0.199163	-0.282208	0.153201	-0.059695
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TE 6,4	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 6,4	1.000000					
TE 6,6	0.568124	1.000000				
TY 1	- -	- -	1.000000			
TY 2	- -	- -	0.122879	1.000000		
TY 3	- -	- -	0.132318	0.397887	1.000000	
TY 4	- -	- -	0.291440	0.288285	0.310430	1.000000
TY 5	- -	- -	0.084101	0.252894	0.272322	0.197308
TY 6	- -	- -	0.153805	0.462499	0.498027	0.483715

Correlation Matrix of Parameter Estimates

	TY 5	TY 6
TY 5	1.000000	
TY 6	0.316543	1.000000

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Covariances

Y - ETA

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
must_r	0.196564	0.160309	0.138724	0.387750	0.060241	0.178636
enjoy_r	0.160309	0.397449	0.343934	0.316232	0.149353	0.442885

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Factor Scores Regressions

ETA

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
must_r	0.039691	0.037960	0.056111	0.315331	0.036080	-0.025492
enjoy_r	0.018577	0.145565	0.215170	0.044673	0.138355	0.291500

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Within Group Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.443356	- -
AS_TALK	- -	0.630436
AS_PRES	- -	0.545550
AS_BORI	0.874581	- -
AS_FUTR	- -	0.236904
AS_ENJOY	- -	0.702506

Correlation Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Within Group Completely Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.352454	- -
AS_TALK	- -	0.607867
AS_PRES	- -	0.654563
AS_BORI	0.826888	- -
AS_FUTR	- -	0.416036
AS_ENJOY	- -	0.760855

Correlation Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.875776					
AS_TALK	- -	0.630498				
AS_PRES	- -	- -	0.571547			
AS_BORI	- -	- -	- -	0.316256		
AS_FUTR	- -	- -	- -	- -	0.826914	
AS_ENJOY	- -	- -	- -	0.122875	- -	0.421100

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Standardized Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Common Metric Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.443356	- -
AS_TALK	- -	0.630436
AS_PRES	- -	0.545550
AS_BORI	0.874581	- -
AS_FUTR	- -	0.236904
AS_ENJOY	- -	0.702506

Covariance Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Common Metric Completely Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.352454	- -
AS_TALK	- -	0.607867
AS_PRES	- -	0.654563
AS_BORI	0.826888	- -
AS_FUTR	- -	0.416036
AS_ENJOY	- -	0.760855

Covariance Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.875776					
AS_TALK	- -	0.630498				
AS_PRES	- -	- -	0.571547			
AS_BORI	- -	- -	- -	0.316256		
AS_FUTR	- -	- -	- -	- -	0.826914	
AS_ENJOY	- -	- -	- -	0.122875	- -	0.421100

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Common Metric Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.443356	- -
AS_TALK	- -	0.630436
AS_PRES	- -	0.545550
AS_BORI	0.874581	- -
AS_FUTR	- -	0.236904
AS_ENJOY	- -	0.702506

Covariance Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Common Metric Completely Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.352454	- -
AS_TALK	- -	0.607867
AS_PRES	- -	0.654563
AS_BORI	0.826888	- -
AS_FUTR	- -	0.416036
AS_ENJOY	- -	0.760855

Covariance Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.573543	1.000000

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.875776					
AS_TALK	- -	0.630498				
AS_PRES	- -	- -	0.571547			
AS_BORI	- -	- -	- -	0.316256		
AS_FUTR	- -	- -	- -	- -	0.826914	
AS_ENJOY	- -	- -	- -	0.122875	- -	0.421100

Time used: 0.150 Seconds

Two groups (attitudes towards reading) – every parameter free over groups

```
DATE: 12/ 3/2004
  TIME:  9:51


L I S R E L  8.54

      BY

Karl G. J"reskog & Dag S"rbom



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```

The following lines were read from file differ_mode.lis:

```
TI Project: c:\dokum. Categorization variable: papi    . Group: casaq
TI title
TI complete set of data
DA NI=6 NO=121 NG=2 MA=CM
LA
'AS_MUST' 'AS_TALK' 'AS_PRES' 'AS_BORI' 'AS_FUTR' 'AS_ENJOY'
RA FI=compl1.raw
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
LE
'must_r' 'enjoy_r'
VA 1.000 LY(1,1) LY(2,2)
FR LY(3,2) LY(4,1) LY(5,2) LY(6,2)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,4) TE(5,5)
FR TE(6,4) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6 FM C
LY=differ_mode.est PS=differ_mode.est C
TE=differ_mode.est TY=differ_mode.est C
AL=differ_mode.est  GF=differ_mode.gft C
PV=differ_mode.pvt C
SV=differ_mode.svt

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

       Number of Input Variables  6
       Number of Y - Variables    6
       Number of X - Variables    0
       Number of ETA - Variables  2
       Number of KSI - Variables  0
       Number of Observations   121
       Number of Groups           2

TI Project: c:\dokum. Categorization variable: papi    . Group: papi
TI title
TI complete set of data
DA NI=6 NO=2807 NG=2 MA=CM
LA
'AS_MUST' 'AS_TALK' 'AS_PRES' 'AS_BORI' 'AS_FUTR' 'AS_ENJOY'
```

```
RA FI=compl2.raw
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
LE
'must_r' 'enjoy_r'
VA 1.000 LY(1,1) LY(2,2)
FR LY(3,2) LY(4,1) LY(5,2) LY(6,2)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,4) TE(5,5)
FR TE(6,4) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6  ND=6 FM C
LY=differ_mode.est PS=differ_mode.est C
TE=differ_mode.est TY=differ_mode.est C
AL=differ_mode.est  GF=differ_mode.gft C
PV=differ_mode.pvt C
SV=differ_mode.svt

TI Project: c:\dokum. Categorization variable: papi    . Group: papi

                    Number of Input Variables  6
                    Number of Y - Variables    6
                    Number of X - Variables    0
                    Number of ETA - Variables  2
                    Number of KSI - Variables  0
                    Number of Observations  2807
                    Number of Groups           2

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

      Covariance Matrix

         AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
        --------   --------   --------   --------   --------   --------
 AS_MUST   1.518320
 AS_TALK   0.089394   1.133333
 AS_PRES   0.149380   0.439394   0.663774
 AS_BORI   0.301791   0.295455   0.255579   1.117218
 AS_FUTR   0.027893   0.252273   0.321832   0.173967   0.642562
AS_ENJOY   0.319146   0.542424   0.486570   0.544353   0.346006   0.920386

      Means

         AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
        --------   --------   --------   --------   --------   --------
        2.479339   2.090909   1.570248   1.685950   1.338843   1.719008

TI Project: c:\dokum. Categorization variable: papi    . Group: papi

      Covariance Matrix

         AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
        --------   --------   --------   --------   --------   --------
 AS_MUST   1.585051
 AS_TALK   0.103614   1.073083
 AS_PRES   0.093793   0.349921   0.695590
 AS_BORI   0.416451   0.299171   0.267723   1.127293
 AS_FUTR   0.028381   0.134576   0.136583   0.112304   0.309518
AS_ENJOY   0.247548   0.442176   0.369393   0.482011   0.153726   0.849008

      Means

         AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
        --------   --------   --------   --------   --------   --------
        2.505878   2.045957   1.473815   1.662985   1.173495   1.598860


TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Parameter Specifications
```

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0	0
AS_TALK	0	0
AS_PRES	0	1
AS_BORI	2	0
AS_FUTR	0	3
AS_ENJOY	0	4

PSI

	must_r	enjoy_r
must_r	5	
enjoy_r	6	7

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	8					
AS_TALK	0	9				
AS_PRES	0	0	10			
AS_BORI	0	0	0	11		
AS_FUTR	0	0	0	0	12	
AS_ENJOY	0	0	0	13	0	14

TAU-Y

AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
15	16	17	18	19	20

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Parameter Specifications

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0	0
AS_TALK	0	0
AS_PRES	0	21
AS_BORI	22	0
AS_FUTR	0	23
AS_ENJOY	0	24

PSI

	must_r	enjoy_r
must_r	25	
enjoy_r	26	27

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	28					
AS_TALK	0	29				
AS_PRES	0	0	30			
AS_BORI	0	0	0	31		
AS_FUTR	0	0	0	0	32	
AS_ENJOY	0	0	0	33	0	34

TAU-Y

```
 AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
--------   --------   --------   --------   --------   --------
    35         36         37         38         39         40
```

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Number of Iterations = 22

LISREL Estimates (Maximum Likelihood)

```
       LAMBDA-Y

          must_r    enjoy_r
        --------   --------
 AS_MUST   1.000000     - -

 AS_TALK     - -      1.000000

 AS_PRES     - -      0.960573
                   (0.150398)
                     6.386874

 AS_BORI   1.524915     - -
        (0.741935)
          2.055323

 AS_FUTR     - -      0.673707
                   (0.132865)
                     5.070598

AS_ENJOY     - -      1.158434
                   (0.180492)
                     6.418216


       Covariance Matrix of ETA

          must_r    enjoy_r
        --------   --------
  must_r   0.151321
 enjoy_r   0.183606   0.449766

       PSI

          must_r    enjoy_r
        --------   --------
  must_r   0.151321
        (0.121182)
          1.248710

 enjoy_r   0.183606   0.449766
        (0.087585) (0.128315)
          2.096318   3.505165
```

```
THETA-EPS

         AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
        --------   --------   --------   --------   --------   --------
 AS_MUST   1.366998
          (0.196349)
           6.962087

 AS_TALK      - -      0.683569
                     (0.103116)
                      6.629136

 AS_PRES      - -        - -      0.248775
                                (0.053141)
                                 4.681376

 AS_BORI      - -        - -        - -      0.753880
                                           (0.203331)
                                            3.707647

 AS_FUTR      - -        - -        - -        - -      0.438422
                                                      (0.062932)
                                                       6.966543

AS_ENJOY      - -        - -        - -      0.211421     - -      0.316814
                                           (0.073341)           (0.073643)
                                            2.882733             4.302045


        Squared Multiple Correlations for Y - Variables

         AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
        --------   --------   --------   --------   --------   --------
        0.099663   0.396852   0.625211   0.318222   0.317697   0.655782

        TAU-Y

         AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
        --------   --------   --------   --------   --------   --------
        2.479339   2.090909   1.570248   1.685950   1.338843   1.719008
      (0.112484) (0.097183) (0.074374) (0.095993) (0.073176) (0.087578)
       22.041697  21.515269  21.112937  17.563286  18.296278  19.628347


LY was written to file differ_mode.est

PS was written to file differ_mode.est

TE was written to file differ_mode.est

TY was written to file differ_mode.est

AL was written to file differ_mode.est


                          Group Goodness of Fit Statistics

                        Contribution to Chi-Square = 9.187540
                   Percentage Contribution to Chi-Square = 13.714213

                      Root Mean Square Residual (RMR) = 0.0437802
                             Standardized RMR = 0.0402049
                        Goodness of Fit Index (GFI) = 0.976292

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Modification Indices and Expected Change

        Modification Indices for LAMBDA-Y

            must_r    enjoy_r
```

	--------	--------
AS_MUST	- -	- -
AS_TALK	0.160150	- -
AS_PRES	0.157155	- -
AS_BORI	- -	- -
AS_FUTR	0.512427	- -
AS_ENJOY	5.214525	- -

Expected Change for LAMBDA-Y

	must_r	enjoy_r
	--------	--------
AS_MUST	- -	- -
AS_TALK	-0.243714	- -
AS_PRES	-0.192000	- -
AS_BORI	- -	- -
AS_FUTR	-0.335798	- -
AS_ENJOY	2.444205	- -

Standardized Expected Change for LAMBDA-Y

	must_r	enjoy_r
	--------	--------
AS_MUST	- -	- -
AS_TALK	-0.094805	- -
AS_PRES	-0.074688	- -
AS_BORI	- -	- -
AS_FUTR	-0.130625	- -
AS_ENJOY	0.950794	- -

Completely Standardized Expected Change for LAMBDA-Y

	must_r	enjoy_r
	--------	--------
AS_MUST	- -	- -
AS_TALK	-0.089053	- -
AS_PRES	-0.091673	- -
AS_BORI	- -	- -
AS_FUTR	-0.162956	- -
AS_ENJOY	0.991064	- -

No Non-Zero Modification Indices for PSI

Modification Indices for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
	--------	--------	--------	--------	--------	--------
AS_MUST	- -					
AS_TALK	1.301478	- -				
AS_PRES	0.382019	0.131394	- -			
AS_BORI	- -	0.022887	0.005614	- -		
AS_FUTR	1.921358	1.443889	2.630920	0.005439	- -	
AS_ENJOY	5.214102	0.573380	2.195393	- -	0.030634	- -

Expected Change for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
	--------	--------	--------	--------	--------	--------
AS_MUST	- -					
AS_TALK	-0.112023	- -				
AS_PRES	-0.042809	0.025293	- -			
AS_BORI	- -	0.011582	-0.004772	- -		
AS_FUTR	-0.106351	-0.071072	0.077717	-0.004329	- -	
AS_ENJOY	0.186651	0.054403	-0.107643	- -	-0.008774	- -

Completely Standardized Expected Change for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	- -					
AS_TALK	-0.085398	- -				
AS_PRES	-0.042643	0.029162	- -			
AS_BORI	- -	0.010346	-0.005570	- -		
AS_FUTR	-0.107672	-0.083284	0.119001	-0.005135	- -	
AS_ENJOY	0.157893	0.053267	-0.137718	- -	-0.011409	- -

No Non-Zero Modification Indices for TAU-Y

No Non-Zero Modification Indices for ALPHA

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Covariances

Y - ETA

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
must_r	0.151321	0.183606	0.176367	0.230751	0.123697	0.212695
enjoy_r	0.183606	0.449766	0.432033	0.279984	0.303010	0.521024

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Factor Scores Regressions

ETA

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
must_r	0.051223	0.047058	0.124204	0.133666	0.049430	0.028419
enjoy_r	0.023531	0.114068	0.301071	-0.018320	0.119819	0.297336

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Within Group Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.388999	- -
AS_TALK	- -	0.670646
AS_PRES	- -	0.644204
AS_BORI	0.593191	- -
AS_FUTR	- -	0.451819
AS_ENJOY	- -	0.776899

Correlation Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.703793	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.703793	1.000000

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Within Group Completely Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.315695	- -
AS_TALK	- -	0.629962
AS_PRES	- -	0.790703
AS_BORI	0.564112	- -
AS_FUTR	- -	0.563646
AS_ENJOY	- -	0.809803

Correlation Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.703793	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.703793	1.000000

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.900337					
AS_TALK	- -	0.603148				
AS_PRES	- -	- -	0.374789			
AS_BORI	- -	- -	- -	0.681778		
AS_FUTR	- -	- -	- -	- -	0.682303	
AS_ENJOY	- -	- -	- -	0.209573	- -	0.344218

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Standardized Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Number of Iterations = 22

LISREL Estimates (Maximum Likelihood)

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	1.000000	- -
AS_TALK	- -	1.000000
AS_PRES	- -	0.859816 (0.036113) 23.808752
AS_BORI	1.993202 (0.214056) 9.311586	- -
AS_FUTR	- -	0.359895 (0.021121) 17.039751

```
AS_ENJOY    - -      1.110155
                  (0.046268)
                   23.993830


       Covariance Matrix of ETA

            must_r    enjoy_r
          --------   --------
  must_r   0.197570
 enjoy_r   0.159643   0.395489

       PSI

            must_r    enjoy_r
          --------   --------
  must_r   0.197570
         (0.028853)
          6.847489

 enjoy_r   0.159643   0.395489
         (0.018224) (0.026462)
          8.760239  14.945687


       THETA-EPS

           AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
          --------   --------   --------   --------   --------   --------
 AS_MUST   1.387481
         (0.042261)
          32.830865

 AS_TALK    - -      0.677594
                   (0.023108)
                    29.322885

 AS_PRES    - -        - -      0.403211
                              (0.014915)
                               27.033676

 AS_BORI    - -        - -        - -      0.334471
                                         (0.076234)
                                          4.387397

 AS_FUTR    - -        - -        - -        - -      0.258293
                                                    (0.007405)
                                                     34.879061

AS_ENJOY    - -        - -        - -      0.116488    - -      0.361589
                                         (0.017053)           (0.019302)
                                          6.830872            18.733321


       Squared Multiple Correlations for Y - Variables

           AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
          --------   --------   --------   --------   --------   --------
          0.124646   0.368554   0.420332   0.701202   0.165501   0.574104


TAU-Y

           AS_MUST    AS_TALK    AS_PRES    AS_BORI    AS_FUTR   AS_ENJOY
          --------   --------   --------   --------   --------   --------
          2.505878   2.045957   1.473815   1.662985   1.173495   1.598860
        (0.023767) (0.019556) (0.015745) (0.019973) (0.010503) (0.017395)
        105.434376 104.622119  93.607427  83.261108 111.733122  91.917537
```

LY was written to file differ_mode.est

PS was written to file differ_mode.est

TE was written to file differ_mode.est

TY was written to file differ_mode.est

AL was written to file differ_mode.est

Global Goodness of Fit Statistics

Degrees of Freedom = 14
Minimum Fit Function Chi-Square = 66.992833 (P = 0.00)
Normal Theory Weighted Least Squares Chi-Square = 67.520958 (P = 0.00)
Estimated Non-centrality Parameter (NCP) = 53.520958
90 Percent Confidence Interval for NCP = (31.595414 ; 82.978865)

Minimum Fit Function Value = 0.0228957
Population Discrepancy Function Value (F0) = 0.0182915
90 Percent Confidence Interval for F0 = (0.0107982 ; 0.0283591)
Root Mean Square Error of Approximation (RMSEA) = 0.0511182
90 Percent Confidence Interval for RMSEA = (0.0392759 ; 0.0636499)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.251599

Expected Cross-Validation Index (ECVI) = 0.0504173
90 Percent Confidence Interval for ECVI = (0.0388228 ; 0.0563838)
ECVI for Saturated Model = 0.0143541
ECVI for Independence Model = 1.474669

Chi-Square for Independence Model with 30 Degrees of Freedom = 4302.882176
Independence AIC = 4326.882176
Model AIC = 147.520958
Saturated AIC = 84.000000
Independence CAIC = 4410.667074
Model CAIC = 426.803953
Saturated CAIC = 377.247145

Normed Fit Index (NFI) = 0.984431
Non-Normed Fit Index (NNFI) = 0.973424
Parsimony Normed Fit Index (PNFI) = 0.459401
Comparative Fit Index (CFI) = 0.987598
Incremental Fit Index (IFI) = 0.987644
Relative Fit Index (RFI) = 0.966637

Critical N (CN) = 1273.897373

Group Goodness of Fit Statistics

Contribution to Chi-Square = 57.805293
Percentage Contribution to Chi-Square = 86.285787

Root Mean Square Residual (RMR) = 0.0242998
Standardized RMR = 0.0231508
Goodness of Fit Index (GFI) = 0.993066

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	- -	- -
AS_TALK	5.208424	- -

AS_PRES	0.944679	- -
AS_BORI	- -	- -
AS_FUTR	0.224902	- -
AS_ENJOY	50.688257	- -

Expected Change for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	- -	- -
AS_TALK	-0.155444	- -
AS_PRES	-0.055149	- -
AS_BORI	- -	- -
AS_FUTR	-0.016854	- -
AS_ENJOY	1.060979	- -

Standardized Expected Change for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	- -	- -
AS_TALK	-0.069093	- -
AS_PRES	-0.024513	- -
AS_BORI	- -	- -
AS_FUTR	-0.007491	- -
AS_ENJOY	0.471593	- -

Completely Standardized Expected Change for LAMBDA-Y

	must_r	enjoy_r
AS_MUST	- -	- -
AS_TALK	-0.066699	- -
AS_PRES	-0.029391	- -
AS_BORI	- -	- -
AS_FUTR	-0.013465	- -
AS_ENJOY	0.511813	- -

No Non-Zero Modification Indices for PSI

Modification Indices for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	- -					
AS_TALK	9.220891	- -				
AS_PRES	12.226819	3.834223	- -			
AS_BORI	- -	0.951397	0.336554	- -		
AS_FUTR	6.839977	1.438467	9.061524	0.297482	- -	
AS_ENJOY	50.688117	1.116363	8.314229	- -	1.536699	- -

Expected Change for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	- -					
AS_TALK	-0.064448	- -				
AS_PRES	-0.059443	0.037813	- -			
AS_BORI	- -	-0.017460	0.008710	- -		
AS_FUTR	-0.031373	-0.011564	0.023682	0.005034	- -	
AS_ENJOY	0.141246	0.020941	-0.049316	- -	-0.010394	- -

Completely Standardized Expected Change for THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	- -					
AS_TALK	-0.049416	- -				
AS_PRES	-0.056611	0.043768	- -			
AS_BORI	- -	-0.015931	0.009871	- -		
AS_FUTR	-0.044791	-0.020065	0.051039	0.008552	- -	
AS_ENJOY	0.121759	0.021940	-0.064173	- -	-0.020276	- -

No Non-Zero Modification Indices for TAU-Y

No Non-Zero Modification Indices for ALPHA

Max. Mod. Index is 50.69 for Element (6, 1) of LAMBDA-Y in Group 2

Covariance Matrix of Parameter Estimates

	LY 3,2	LY 4,1	LY 5,2	LY 6,2	PS 1,1	PS 2,1
LY 3,2	0.022620					
LY 4,1	-0.000888	0.550467				
LY 5,2	0.010584	0.000044	0.017653			
LY 6,2	0.017515	0.016161	0.012781	0.032577		
PS 1,1	0.000001	-0.072125	0.000000	-0.000826	0.014685	
PS 2,1	-0.002948	-0.051976	-0.002017	-0.003629	0.008282	0.007671
PS 2,2	-0.014300	-0.000589	-0.009889	-0.017459	0.000563	0.004030
TE 1,1	-0.000001	0.037382	0.000000	0.000826	-0.007408	-0.003636
TE 2,2	0.003356	0.000589	0.002214	0.004261	-0.000001	-0.000562
TE 3,3	-0.002368	0.001310	-0.000021	0.000975	-0.000002	0.000099
TE 4,4	0.000386	-0.068210	-0.000019	-0.003269	0.000027	0.005945
TE 5,5	0.000076	0.000241	-0.001287	0.000179	0.000000	0.000018
TE 6,4	0.000476	-0.010060	-0.000024	-0.002407	0.000867	0.000123
TE 6,6	0.000938	-0.006051	-0.000047	-0.004401	0.000359	0.000221
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -
LY 3,2	- -	- -	- -	- -	- -	- -
LY 4,1	- -	- -	- -	- -	- -	- -
LY 5,2	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,4	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,4	TE 5,5
PS 2,2	0.016465					
TE 1,1	-0.000001	0.038553				
TE 2,2	-0.002845	0.000001	0.010633			
TE 3,3	0.000275	0.000002	-0.000275	0.002824		
TE 4,4	0.000256	-0.000027	-0.000256	-0.000569	0.041344	
TE 5,5	0.000050	0.000000	-0.000050	-0.000112	-0.000104	0.003960
TE 6,4	0.000316	-0.000867	-0.000316	-0.000702	0.005843	-0.000129
TE 6,6	0.000622	-0.000359	-0.000622	-0.001385	0.002644	-0.000254

TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -
LY 3,2	- -	- -	- -	- -	- -	- -
LY 4,1	- -	- -	- -	- -	- -	- -
LY 5,2	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,4	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TE 6,4	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 6,4	0.005379					
TE 6,6	0.003201	0.005423				
TY 1	- -	- -	0.012653			
TY 2	- -	- -	0.001530	0.009444		
TY 3	- -	- -	0.001470	0.003600	0.005531	
TY 4	- -	- -	0.001923	0.002333	0.002241	0.009215
TY 5	- -	- -	0.001031	0.002525	0.002426	0.001572
TY 6	- -	- -	0.001772	0.004342	0.004171	0.004465
LY 3,2	- -	- -	- -	- -	- -	- -
LY 4,1	- -	- -	- -	- -	- -	- -
LY 5,2	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,4	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TY 5	TY 6	LY 3,2	LY 4,1	LY 5,2	LY 6,2
TY 5	0.005355					
TY 6	0.002925	0.007670				
LY 3,2	- -	- -	0.001304			
LY 4,1	- -	- -	-0.000033	0.045820		
LY 5,2	- -	- -	0.000294	0.000022	0.000446	
LY 6,2	- -	- -	0.000887	0.001052	0.000393	0.002141
PS 1,1	- -	- -	0.000003	-0.005610	-0.000002	-0.000085
PS 2,1	- -	- -	-0.000131	-0.003350	-0.000054	-0.000199

PS 2,2	- -	- -	-0.000647	-0.000161	-0.000270	-0.000931
TE 1,1	- -	- -	-0.000003	0.003639	0.000002	0.000085
TE 2,2	- -	- -	0.000231	0.000161	0.000096	0.000394
TE 3,3	- -	- -	-0.000162	0.000141	-0.000001	0.000085
TE 4,4	- -	- -	0.000015	-0.013424	-0.000010	-0.000417
TE 5,5	- -	- -	0.000000	0.000015	-0.000026	0.000009
TE 6,4	- -	- -	0.000012	-0.000787	-0.000008	-0.000265
TE 6,6	- -	- -	0.000019	-0.000497	-0.000012	-0.000447
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	PS 1,1	PS 2,1	PS 2,2	TE 1,1	TE 2,2	TE 3,3
PS 1,1	0.000832					
PS 2,1	0.000446	0.000332				
PS 2,2	0.000031	0.000163	0.000700			
TE 1,1	-0.000414	-0.000266	-0.000013	0.001786		
TE 2,2	-0.000013	-0.000041	-0.000207	0.000013	0.000534	
TE 3,3	-0.000011	0.000002	0.000005	0.000011	-0.000005	0.000222
TE 4,4	0.001230	0.000964	0.000073	-0.001230	-0.000073	-0.000064
TE 5,5	-0.000001	0.000000	0.000000	0.000001	0.000000	0.000000
TE 6,4	0.000074	0.000018	0.000061	-0.000074	-0.000061	-0.000054
TE 6,6	0.000043	0.000030	0.000092	-0.000043	-0.000092	-0.000080
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TE 4,4	TE 5,5	TE 6,4	TE 6,6	TY 1	TY 2
TE 4,4	0.005812					
TE 5,5	-0.000007	0.000055				
TE 6,4	0.000390	-0.000006	0.000291			
TE 6,6	0.000225	-0.000008	0.000188	0.000373		
TY 1	- -	- -	- -	- -	0.000565	
TY 2	- -	- -	- -	- -	0.000057	0.000382
TY 3	- -	- -	- -	- -	0.000049	0.000121
TY 4	- -	- -	- -	- -	0.000140	0.000113
TY 5	- -	- -	- -	- -	0.000020	0.000051
TY 6	- -	- -	- -	- -	0.000063	0.000156

Covariance Matrix of Parameter Estimates

	TY 3	TY 4	TY 5	TY 6
TY 3	0.000248			
TY 4	0.000098	0.000399		
TY 5	0.000044	0.000041	0.000110	
TY 6	0.000135	0.000167	0.000056	0.000303

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Correlation Matrix of Parameter Estimates

	LY 3,2	LY 4,1	LY 5,2	LY 6,2	PS 1,1	PS 2,1

LY 3,2	1.000000					
LY 4,1	-0.007954	1.000000				
LY 5,2	0.529678	0.000449	1.000000			
LY 6,2	0.645235	0.120681	0.532948	1.000000		
PS 1,1	0.000063	-0.802202	-0.000004	-0.037749	1.000000	
PS 2,1	-0.223764	-0.799848	-0.173337	-0.229542	0.780343	1.000000
PS 2,2	-0.740975	-0.006187	-0.580072	-0.753854	0.036182	0.358564
TE 1,1	-0.000039	0.256610	0.000002	0.023298	-0.311348	-0.211436
TE 2,2	0.216396	0.007699	0.161601	0.228960	-0.000061	-0.062182
TE 3,3	-0.296253	0.033235	-0.002920	0.101671	-0.000262	0.021185
TE 4,4	0.012608	-0.452147	-0.000711	-0.089083	0.001084	0.333805
TE 5,5	0.008025	0.005152	-0.153892	0.015760	-0.000041	0.003284
TE 6,4	0.043122	-0.184870	-0.002433	-0.181858	0.097576	0.019166
TE 6,6	0.084677	-0.110738	-0.004777	-0.331077	0.040183	0.034186
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -
LY 3,2	- -	- -	- -	- -	- -	- -
LY 4,1	- -	- -	- -	- -	- -	- -
LY 5,2	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,4	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,4	TE 5,5
PS 2,2	1.000000					
TE 1,1	-0.000030	1.000000				
TE 2,2	-0.215028	0.000037	1.000000			
TE 3,3	0.040270	0.000162	-0.050111	1.000000		
TE 4,4	0.009807	-0.000669	-0.012204	-0.052681	1.000000	
TE 5,5	0.006242	0.000025	-0.007768	-0.033531	-0.008166	1.000000
TE 6,4	0.033544	-0.060221	-0.041742	-0.180188	0.391804	-0.027931
TE 6,6	0.065869	-0.024800	-0.081967	-0.353826	0.176570	-0.054846
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -

TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -
LY 3,2	- -	- -	- -	- -	- -	- -
LY 4,1	- -	- -	- -	- -	- -	- -
LY 5,2	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,4	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TE 6,4	TE 6,6	TY 1	TY 2	TY 3	TY 4
	--------	--------	--------	--------	--------	--------
TE 6,4	1.000000					
TE 6,6	0.592720	1.000000				
TY 1	- -	- -	1.000000			
TY 2	- -	- -	0.139967	1.000000		
TY 3	- -	- -	0.175681	0.498113	1.000000	
TY 4	- -	- -	0.178087	0.250106	0.313923	1.000000
TY 5	- -	- -	0.125233	0.355076	0.445677	0.223778
TY 6	- -	- -	0.179925	0.510145	0.640314	0.531079
LY 3,2	- -	- -	- -	- -	- -	- -
LY 4,1	- -	- -	- -	- -	- -	- -
LY 5,2	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,4	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TY 5	TY 6	LY 3,2	LY 4,1	LY 5,2	LY 6,2
	--------	--------	--------	--------	--------	--------
TY 5	1.000000					
TY 6	0.456443	1.000000				
LY 3,2	- -	- -	1.000000			
LY 4,1	- -	- -	-0.004225	1.000000		
LY 5,2	- -	- -	0.385363	0.004863	1.000000	
LY 6,2	- -	- -	0.530618	0.106227	0.401689	1.000000
PS 1,1	- -	- -	0.002546	-0.908341	-0.002931	-0.063520
PS 2,1	- -	- -	-0.198676	-0.858704	-0.140965	-0.236308
PS 2,2	- -	- -	-0.676788	-0.028480	-0.482294	-0.760117
TE 1,1	- -	- -	-0.001738	0.402250	0.002001	0.043366
TE 2,2	- -	- -	0.277407	0.032613	0.196157	0.368961

TE 3,3	- -	- -	-0.300252	0.044311	-0.001994	0.123209
TE 4,4	- -	- -	0.005366	-0.822604	-0.006178	-0.118281
TE 5,5	- -	- -	0.000361	0.009233	-0.165070	0.025672
TE 6,4	- -	- -	0.020069	-0.215484	-0.023104	-0.335898
TE 6,6	- -	- -	0.026607	-0.120210	-0.030630	-0.500229
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	PS 1,1	PS 2,1	PS 2,2	TE 1,1	TE 2,2	TE 3,3
	--------	--------	--------	--------	--------	--------
PS 1,1	1.000000					
PS 2,1	0.848568	1.000000				
PS 2,2	0.040957	0.337500	1.000000			
TE 1,1	-0.339438	-0.345153	-0.011719	1.000000		
TE 2,2	-0.019656	-0.096529	-0.338081	0.013420	1.000000	
TE 3,3	-0.026706	0.006891	0.011679	0.018233	-0.013374	1.000000
TE 4,4	0.559041	0.693720	0.036178	-0.381670	-0.041428	-0.056288
TE 5,5	-0.005565	0.001436	0.002434	0.003799	-0.002787	-0.003786
TE 6,4	0.151006	0.056851	0.135295	-0.103095	-0.154931	-0.210501
TE 6,6	0.077316	0.084836	0.179370	-0.052785	-0.205403	-0.279076
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TE 4,4	TE 5,5	TE 6,4	TE 6,6	TY 1	TY 2
	--------	--------	--------	--------	--------	--------
TE 4,4	1.000000					
TE 5,5	-0.011728	1.000000				
TE 6,4	0.299697	-0.043861	1.000000			
TE 6,6	0.153240	-0.058149	0.569644	1.000000		
TY 1	- -	- -	- -	- -	1.000000	
TY 2	- -	- -	- -	- -	0.122408	1.000000
TY 3	- -	- -	- -	- -	0.130724	0.393592
TY 4	- -	- -	- -	- -	0.295638	0.290331
TY 5	- -	- -	- -	- -	0.082028	0.246973
TY 6	- -	- -	- -	- -	0.152776	0.459987

Correlation Matrix of Parameter Estimates

	TY 3	TY 4	TY 5	TY 6
	--------	--------	--------	--------
TY 3	1.000000			
TY 4	0.310055	1.000000		
TY 5	0.263752	0.194555	1.000000	
TY 6	0.491237	0.481849	0.308244	1.000000

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Covariances

Y - ETA

AS_MUST AS_TALK AS_PRES AS_BORI AS_FUTR AS_ENJOY

must_r	0.197570	0.159643	0.137263	0.393797	0.057455	0.177228
enjoy_r	0.159643	0.395489	0.340048	0.318200	0.142334	0.439054

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Factor Scores Regressions

ETA

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
must_r	0.037887	0.036964	0.053409	0.322691	0.034899	-0.027059
enjoy_r	0.018052	0.147042	0.212463	0.048120	0.138827	0.290397

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Within Group Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.444488	- -
AS_TALK	- -	0.628879
AS_PRES	- -	0.540720
AS_BORI	0.885955	- -
AS_FUTR	- -	0.226330
AS_ENJOY	- -	0.698154

Correlation Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.571113	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.571113	1.000000

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Within Group Completely Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.353052	- -
AS_TALK	- -	0.607087
AS_PRES	- -	0.648330
AS_BORI	0.837378	- -
AS_FUTR	- -	0.406818
AS_ENJOY	- -	0.757696

Correlation Matrix of ETA

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.571113	1.000000

PSI

	must_r	enjoy_r
must_r	1.000000	
enjoy_r	0.571113	1.000000

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.875354					
AS_TALK	- -	0.631446				
AS_PRES	- -	- -	0.579668			
AS_BORI	- -	- -	- -	0.298798		
AS_FUTR	- -	- -	- -	- -	0.834499	
AS_ENJOY	- -	- -	- -	0.119491	- -	0.425896

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Standardized Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Common Metric Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.442350	- -
AS_TALK	- -	0.630647
AS_PRES	- -	0.605782
AS_BORI	0.674546	- -
AS_FUTR	- -	0.424871
AS_ENJOY	- -	0.730563

Covariance Matrix of ETA

	must_r	enjoy_r
must_r	0.773334	
enjoy_r	0.658166	1.130874

PSI

	must_r	enjoy_r
must_r	0.773334	
enjoy_r	0.658166	1.130874

TI Project: c:\dokum. Categorization variable: papi . Group: casaq

Common Metric Completely Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.351657	- -
AS_TALK	- -	0.608093
AS_PRES	- -	0.727022
AS_BORI	0.637719	- -
AS_FUTR	- -	0.747372
AS_ENJOY	- -	0.791506

Covariance Matrix of ETA

	must_r	enjoy_r
must_r	0.773334	
enjoy_r	0.658166	1.130874

PSI

	must_r	enjoy_r
must_r	0.773334	
enjoy_r	0.658166	1.130874

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.863924					
AS_TALK	- -	0.635550				
AS_PRES	- -	- -	0.358319			
AS_BORI	- -	- -	- -	0.673813		
AS_FUTR	- -	- -	- -	- -	1.356600	
AS_ENJOY	- -	- -	- -	0.216553	- -	0.371875

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Common Metric Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.442350	- -
AS_TALK	- -	0.630647
AS_PRES	- -	0.542240
AS_BORI	0.881692	- -
AS_FUTR	- -	0.226966
AS_ENJOY	- -	0.700116

Covariance Matrix of ETA

	must_r	enjoy_r
must_r	1.009694	
enjoy_r	0.572266	0.994403

PSI

	must_r	enjoy_r

	--------	--------
must_r	1.009694	
enjoy_r	0.572266	0.994403

TI Project: c:\dokum. Categorization variable: papi . Group: papi

Common Metric Completely Standardized Solution

LAMBDA-Y

	must_r	enjoy_r
AS_MUST	0.351657	- -
AS_TALK	- -	0.608093
AS_PRES	- -	0.650763
AS_BORI	0.833557	- -
AS_FUTR	- -	0.399247
AS_ENJOY	- -	0.758519

Covariance Matrix of ETA

	must_r	enjoy_r
must_r	1.009694	
enjoy_r	0.572266	0.994403

PSI

	must_r	enjoy_r
must_r	1.009694	
enjoy_r	0.572266	0.994403

THETA-EPS

	AS_MUST	AS_TALK	AS_PRES	AS_BORI	AS_FUTR	AS_ENJOY
AS_MUST	0.876868					
AS_TALK	- -	0.629995				
AS_PRES	- -	- -	0.580758			
AS_BORI	- -	- -	- -	0.298947		
AS_FUTR	- -	- -	- -	- -	0.799230	
AS_ENJOY	- -	- -	- -	0.119315	- -	0.424433

Time used: 0.230 Seconds

Merged database – attitudes towards mathematics

```
DATE: 12/ 3/2004
  TIME: 10:05


L I S R E L  8.54

      BY

Karl G. J"reskog & Dag S"rbom
```



```
The following lines were read from file model.lis:

TI Project: c:\dokum. Categorization variable: baza    . Group: timss
TI title
TI neobrnjene sprem
DA NI=6 NO=2964 NG=1 MA=CM
LA
'A_WELL1' 'A_MORE1' 'A_HARD1' 'A_ENYO1' 'A_GOOD1' 'A_QUIC1'
RA FI=timss1.raw
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
LE
'enjoy' 'diffic'
VA 1.000 LY(1,1) LY(3,2)
FR LY(2,1) LY(4,1) LY(5,2) LY(6,1)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,2) TE(4,4)
FR TE(5,5) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6 FM C
LY=model.est PS=model.est TE=model.est C
TY=model.est AL=model.est  GF=model.gft C
PV=model.pvt C
SV=model.svt

TI Project: c:\dokum. Categorization variable: baza . Group: timss

              Number of Input Variables  6
              Number of Y - Variables    6
              Number of X - Variables    0
              Number of ETA - Variables  2
              Number of KSI - Variables  0
              Number of Observations  2964

TI Project: c:\dokum. Categorization variable: baza . Group: timss
```

Covariance Matrix

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.589207					
A_MORE1	0.158450	1.349123				
A_HARD1	-0.157701	-0.236382	1.051039			
A_ENYO1	0.191957	0.686051	-0.205483	1.060360		
A_GOOD1	-0.209182	-0.183666	0.482175	-0.198967	0.884931	
A_QUIC1	0.204860	0.226744	-0.230288	0.261222	-0.264268	0.586159

Means

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
3.397436	2.774629	1.885628	3.153846	1.656883	3.447368

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Parameter Specifications

LAMBDA-Y

	enjoy	diffic
A_WELL1	0	0
A_MORE1	1	0
A_HARD1	0	0
A_ENYO1	2	0
A_GOOD1	0	3
A_QUIC1	4	0

PSI

	enjoy	diffic
enjoy	5	
diffic	6	7

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	8					
A_MORE1	0	9				
A_HARD1	0	0	10			
A_ENYO1	0	11	0	12		
A_GOOD1	0	0	0	0	13	
A_QUIC1	0	0	0	0	0	14

TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
15	16	17	18	19	20

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Number of Iterations = 10

LISREL Estimates (Maximum Likelihood)

LAMBDA-Y

	enjoy	diffic
A_WELL1	1.000000	- -

```
A_MORE1   1.070794    - -
       (0.078143)
        13.703007

A_HARD1    - -       1.000000

A_ENYO1   1.205417    - -
       (0.074167)
        16.252697

A_GOOD1    - -       1.138650
                (0.058369)
                 19.507937

A_QUIC1   1.367855    - -
       (0.074593)
        18.337646
```

Covariance Matrix of ETA

```
           enjoy    diffic
        --------   --------
 enjoy   0.153761
diffic  -0.168533   0.423462
```

PSI

```
           enjoy    diffic
        --------   --------
 enjoy   0.153761
       (0.013118)
        11.721185

diffic  -0.168533   0.423462
       (0.011924) (0.029651)
       -14.134450  14.281703
```

THETA-EPS

```
          A_WELL1    A_MORE1    A_HARD1    A_ENYO1    A_GOOD1    A_QUIC1
         --------   --------   --------   --------   --------   --------
A_WELL1   0.435447
       (0.013919)
        31.285150

A_MORE1    - -       1.172821
                (0.033195)
                 35.330897

A_HARD1    - -        - -       0.627577
                           (0.025792)
                            24.332666

A_ENYO1    - -       0.487584    - -       0.836941
                (0.023361)           (0.025294)
                 20.871341            33.088647

A_GOOD1    - -        - -        - -        - -       0.335903
                                                 (0.027340)
                                                  12.286189

A_QUIC1    - -        - -        - -        - -        - -       0.298469
                                                            (0.015512)
                                                             19.240975
```

Squared Multiple Correlations for Y - Variables

```
 A_WELL1    A_MORE1    A_HARD1    A_ENYO1    A_GOOD1    A_QUIC1
--------   --------   --------   --------   --------   --------
0.260962   0.130679   0.402898   0.210701   0.620419   0.490806
```

TAU-Y

```
 A_WELL1    A_MORE1    A_HARD1    A_ENYO1    A_GOOD1    A_QUIC1
--------   --------   --------   --------   --------   --------
3.397436   2.774629   1.885628   3.153846   1.656883   3.447368
(0.014102) (0.021338) (0.018834) (0.018917) (0.017282) (0.014065)
240.925671 130.030405 100.118046 166.716925  95.874456 245.101385
```

LY was written to file model.est

PS was written to file model.est

TE was written to file model.est

TY was written to file model.est

AL was written to file model.est

Goodness of Fit Statistics

Degrees of Freedom = 7
Minimum Fit Function Chi-Square = 29.650423 (P = .11005293D-03)
Normal Theory Weighted Least Squares Chi-Square = 29.585948 (P = .11308419D-03)
Estimated Non-centrality Parameter (NCP) = 22.585948
90 Percent Confidence Interval for NCP = (9.404261 ; 43.308607)

Minimum Fit Function Value = 0.0100069
Population Discrepancy Function Value (F0) = 0.00762266
90 Percent Confidence Interval for F0 = (0.00317390 ; 0.0146165)
Root Mean Square Error of Approximation (RMSEA) = 0.0329993
90 Percent Confidence Interval for RMSEA = (0.0212935 ; 0.0456954)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.987511

Expected Cross-Validation Index (ECVI) = 0.0234850
90 Percent Confidence Interval for ECVI = (0.0170112 ; 0.0284538)
ECVI for Saturated Model = 0.0141748
ECVI for Independence Model = 1.462436

Chi-Square for Independence Model with 15 Degrees of Freedom = 4321.199073
Independence AIC = 4333.199073
Model AIC = 69.585948
Saturated AIC = 42.000000
Independence CAIC = 4375.164843
Model CAIC = 209.471848
Saturated CAIC = 188.880195

Normed Fit Index (NFI) = 0.993138
Non-Normed Fit Index (NNFI) = 0.988729
Parsimony Normed Fit Index (PNFI) = 0.463465
Comparative Fit Index (CFI) = 0.994740
Incremental Fit Index (IFI) = 0.994750
Relative Fit Index (RFI) = 0.985297

Critical N (CN) = 1847.301805

Root Mean Square Residual (RMR) = 0.0158081
Standardized RMR = 0.0151117
Goodness of Fit Index (GFI) = 0.996683
Adjusted Goodness of Fit Index (AGFI) = 0.990048
Parsimony Goodness of Fit Index (PGFI) = 0.332228

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	enjoy	diffic
A_WELL1	- -	2.253806
A_MORE1	- -	2.152710
A_HARD1	- -	- -
A_ENYO1	- -	7.546970
A_GOOD1	- -	- -
A_QUIC1	- -	0.183642

Expected Change for LAMBDA-Y

	enjoy	diffic
A_WELL1	- -	-0.077283
A_MORE1	- -	-0.080998
A_HARD1	- -	- -
A_ENYO1	- -	0.138761
A_GOOD1	- -	- -
A_QUIC1	- -	-0.031643

Standardized Expected Change for LAMBDA-Y

	enjoy	diffic
A_WELL1	- -	-0.050291
A_MORE1	- -	-0.052709
A_HARD1	- -	- -
A_ENYO1	- -	0.090297
A_GOOD1	- -	- -
A_QUIC1	- -	-0.020592

Completely Standardized Expected Change for LAMBDA-Y

	enjoy	diffic
A_WELL1	- -	-0.065517
A_MORE1	- -	-0.045379
A_HARD1	- -	- -
A_ENYO1	- -	0.087690
A_GOOD1	- -	- -
A_QUIC1	- -	-0.026896

No Non-Zero Modification Indices for PSI

Modification Indices for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	0.991392	- -				
A_HARD1	4.099499	14.595410	- -			
A_ENYO1	1.322281	- -	0.883298	- -		
A_GOOD1	8.794375	2.813808	- -	3.053792	- -	
A_QUIC1	3.773272	0.224942	0.035883	2.276415	0.229191	- -

Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	-0.012887	- -				
A_HARD1	0.025010	-0.058974	- -			
A_ENYO1	0.013415	- -	0.012793	- -		
A_GOOD1	-0.035005	0.023530	- -	0.021900	- -	
A_QUIC1	-0.030300	-0.006823	0.002746	0.020603	-0.006983	- -

Completely Standardized Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	-0.014455	- -				
A_HARD1	0.031782	-0.049525	- -			
A_ENYO1	0.016971	- -	0.012118	- -		
A_GOOD1	-0.048477	0.021535	- -	0.022609	- -	
A_QUIC1	-0.051559	-0.007673	0.003499	0.026134	-0.009695	- -

No Non-Zero Modification Indices for TAU-Y

No Non-Zero Modification Indices for ALPHA

Maximum Modification Index is 14.60 for Element (3, 2) of THETA-EPS

Covariance Matrix of Parameter Estimates

	LY 2,1	LY 4,1	LY 5,2	LY 6,1	PS 1,1	PS 2,1
LY 2,1	0.006106					
LY 4,1	0.004005	0.005501				
LY 5,2	0.000000	0.000000	0.003407			
LY 6,1	0.002470	0.002781	0.000000	0.005564		
PS 1,1	-0.000549	-0.000618	0.000000	-0.000784	0.000172	
PS 2,1	0.000301	0.000338	0.000357	0.000481	-0.000102	0.000142
PS 2,2	0.000000	0.000000	-0.001409	0.000000	0.000019	-0.000217
TE 1,1	0.000235	0.000264	0.000000	0.000382	-0.000066	0.000035
TE 2,2	-0.000533	-0.000257	0.000000	0.000086	0.000002	-0.000002
TE 3,3	0.000000	0.000000	0.000926	0.000000	0.000000	0.000097
TE 4,2	-0.000429	-0.000349	0.000000	0.000097	0.000002	-0.000002
TE 4,4	-0.000290	-0.000460	0.000000	0.000109	0.000002	-0.000003
TE 5,5	0.000000	0.000000	-0.001201	0.000000	0.000000	-0.000126
TE 6,6	-0.000011	-0.000013	0.000000	-0.000597	0.000038	-0.000044
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,2	TE 4,4
PS 2,2	0.000879					
TE 1,1	0.000000	0.000194				
TE 2,2	0.000000	-0.000002	0.001102			
TE 3,3	-0.000399	0.000000	0.000000	0.000665		
TE 4,2	0.000000	-0.000002	0.000525	0.000000	0.000546	
TE 4,4	0.000000	-0.000002	0.000253	0.000000	0.000402	0.000640
TE 5,5	0.000375	0.000000	0.000000	-0.000375	0.000000	0.000000
TE 6,6	0.000000	-0.000038	-0.000040	0.000000	-0.000045	-0.000050
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TE 5,5	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 5,5	0.000747					
TE 6,6	0.000000	0.000241				
TY 1	- -	- -	0.000199			
TY 2	- -	- -	0.000056	0.000455		
TY 3	- -	- -	-0.000057	-0.000061	0.000355	
TY 4	- -	- -	0.000063	0.000232	-0.000069	0.000358
TY 5	- -	- -	-0.000065	-0.000069	0.000163	-0.000078
TY 6	- -	- -	0.000071	0.000076	-0.000078	0.000086

Covariance Matrix of Parameter Estimates

	TY 5	TY 6
TY 5	0.000299	
TY 6	-0.000089	0.000198

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Correlation Matrix of Parameter Estimates

	LY 2,1	LY 4,1	LY 5,2	LY 6,1	PS 1,1	PS 2,1
LY 2,1	1.000000					
LY 4,1	0.690981	1.000000				
LY 5,2	0.000000	0.000000	1.000000			
LY 6,1	0.423750	0.502597	0.000000	1.000000		
PS 1,1	-0.535834	-0.635535	0.000000	-0.801595	1.000000	
PS 2,1	0.322723	0.382771	0.512837	0.541173	-0.651757	1.000000
PS 2,2	0.000000	0.000000	-0.813921	0.000000	0.049290	-0.612670
TE 1,1	0.215649	0.255774	0.000000	0.368255	-0.360051	0.210398
TE 2,2	-0.205580	-0.104512	0.000000	0.034738	0.004264	-0.005513
TE 3,3	0.000000	0.000000	0.615300	0.000000	0.000000	0.315548
TE 4,2	-0.234898	-0.201419	0.000000	0.055567	0.006820	-0.008819
TE 4,4	-0.146548	-0.245020	0.000000	0.057774	0.007091	-0.009169
TE 5,5	0.000000	0.000000	-0.752573	0.000000	0.000000	-0.385947
TE 6,6	-0.009300	-0.011031	0.000000	-0.516236	0.185874	-0.240336
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,2	TE 4,4
PS 2,2	1.000000					
TE 1,1	0.000000	1.000000				
TE 2,2	0.000000	-0.004019	1.000000			
TE 3,3	-0.522215	0.000000	0.000000	1.000000		
TE 4,2	0.000000	-0.006428	0.676735	0.000000	1.000000	
TE 4,4	0.000000	-0.006683	0.301505	0.000000	0.679944	1.000000
TE 5,5	0.463192	0.000000	0.000000	-0.532497	0.000000	0.000000
TE 6,6	0.000000	-0.175184	-0.077013	0.000000	-0.123189	-0.128082
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TE 5,5	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 5,5	1.000000					
TE 6,6	0.000000	1.000000				
TY 1	- -	- -	1.000000			
TY 2	- -	- -	0.184668	1.000000		
TY 3	- -	- -	-0.214162	-0.151550	1.000000	
TY 4	- -	- -	0.234489	0.573593	-0.192436	1.000000
TY 5	- -	- -	-0.265758	-0.188062	0.499966	-0.238798
TY 6	- -	- -	0.357885	0.253255	-0.293703	0.321579

Correlation Matrix of Parameter Estimates

	TY 5	TY 6
TY 5	1.000000	
TY 6	-0.364463	1.000000

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Covariances

Y - ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
enjoy	0.153761	0.164646	-0.168533	0.185346	-0.191900	0.210322
diffic	-0.168533	-0.180464	0.423462	-0.203153	0.482175	-0.230529

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Factor Scores Regressions

ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
enjoy	0.115962	0.020939	-0.038312	0.060528	-0.081504	0.231414
diffic	-0.055217	-0.009970	0.183503	-0.028821	0.390379	-0.110191

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Standardized Solution

LAMBDA-Y

	enjoy	diffic
A_WELL1	0.392123	- -
A_MORE1	0.419883	- -
A_HARD1	- -	0.650739
A_ENYO1	0.472672	- -
A_GOOD1	- -	0.740964
A_QUIC1	0.536368	- -

Correlation Matrix of ETA

	enjoy	diffic
enjoy	1.000000	
diffic	-0.660474	1.000000

PSI

	enjoy	diffic
enjoy	1.000000	
diffic	-0.660474	1.000000

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Completely Standardized Solution

LAMBDA-Y

	enjoy	diffic
A_WELL1	0.510844	- -
A_MORE1	0.361495	- -
A_HARD1	- -	0.634743
A_ENYO1	0.459022	- -
A_GOOD1	- -	0.787667
A_QUIC1	0.700576	- -

Correlation Matrix of ETA

	enjoy	diffic
enjoy	1.000000	
diffic	-0.660474	1.000000

PSI

	enjoy	diffic
enjoy	1.000000	
diffic	-0.660474	1.000000

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.739038					
A_MORE1	- -	0.869321				
A_HARD1	- -	- -	0.597102			
A_ENYO1	- -	0.407659	- -	0.789299		
A_GOOD1	- -	- -	- -	- -	0.379581	
A_QUIC1	- -	- -	- -	- -	- -	0.509194

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: baza . Group: timss

Standardized Total and Indirect Effects

Time used: 0.210 Seconds

Two group model (attitudes towards mathematics) – with constraints

```
                    DATE: 12/ 3/2004
                      TIME: 10:07


                    L I S R E L  8.54

                           BY

                 Karl G. J"reskog & Dag S"rbom



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The following lines were read from file model.lis:

TI Project: c:\dokum. Categorization variable: timss3  . Group: papi
TI title
TI dve bazi 18.11
DA NI=6 NO=2839 NG=2 MA=CM
LA
'A_WELL1' 'A_MORE1' 'A_HARD1' 'A_ENYO1' 'A_GOOD1' 'A_QUIC1'
RA FI=timss1.raw
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
LE
'diff_m' 'enjoy_m'
VA 1.000 LY(1,2) LY(3,1)
FR LY(2,2) LY(4,2) LY(5,1) LY(6,2)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,2) TE(4,4)
FR TE(5,5) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6 FM C
LY=model.est PS=model.est TE=model.est C
TY=model.est AL=model.est  GF=model.gft C
PV=model.pvt C
SV=model.svt

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

                 Number of Input Variables  6
                 Number of Y - Variables    6
                 Number of X - Variables    0
                 Number of ETA - Variables  2
                 Number of KSI - Variables  0
                 Number of Observations  2839
                 Number of Groups           2

TI Project: c:\dokum. Categorization variable: timss3  . Group: casaq
TI title
TI dve bazi 18.11
DA NI=6 NO=125 NG=2 MA=CM
LA
'A_WELL1' 'A_MORE1' 'A_HARD1' 'A_ENYO1' 'A_GOOD1' 'A_QUIC1'
RA FI=timss2.raw
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
```

```
LE
'diff_m' 'enjoy_m'
VA 1.000 LY(1,2) LY(3,1)
FR LY(2,2) LY(4,2) LY(5,1) LY(6,2)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,2) TE(4,4)
FR TE(5,5) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
EQ LY(2,2,2) LY(1,2,2)
EQ LY(2,4,2) LY(1,4,2)
EQ LY(2,5,1) LY(1,5,1)
EQ LY(2,6,2) LY(1,6,2)
EQ PS(2,1,1) PS(1,1,1)
EQ PS(2,2,1) PS(1,2,1)
EQ PS(2,2,2) PS(1,2,2)
EQ TE(2,1,1) TE(1,1,1)
EQ TE(2,2,2) TE(1,2,2)
EQ TE(2,3,3) TE(1,3,3)
EQ TE(2,4,2) TE(1,4,2)
EQ TE(2,4,4) TE(1,4,4)
EQ TE(2,5,5) TE(1,5,5)
EQ TE(2,6,6) TE(1,6,6)
EQ TY(2,1) TY(1,1)
EQ TY(2,2) TY(1,2)
EQ TY(2,3) TY(1,3)
EQ TY(2,4) TY(1,4)
EQ TY(2,5) TY(1,5)
EQ TY(2,6) TY(1,6)
OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6  ND=6 FM C
LY=model.est PS=model.est TE=model.est C
TY=model.est AL=model.est  GF=model.gft C
PV=model.pvt C
SV=model.svt

TI Project: c:\dokum. Categorization variable: timss3  . Group: casaq

              Number of Input Variables  6
              Number of Y - Variables    6
              Number of X - Variables    0
              Number of ETA - Variables  2
              Number of KSI - Variables  0
              Number of Observations   125
              Number of Groups           2

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

   Covariance Matrix

          A_WELL1   A_MORE1   A_HARD1   A_ENYO1   A_GOOD1   A_QUIC1
         --------  --------  --------  --------  --------  --------
 A_WELL1   0.575329
 A_MORE1   0.158332   1.353548
 A_HARD1  -0.154974  -0.234056   1.046214
 A_ENYO1   0.191594   0.692812  -0.203236   1.070622
 A_GOOD1  -0.213278  -0.186244   0.481173  -0.203355   0.885479
 A_QUIC1   0.205577   0.232976  -0.224286   0.265812  -0.261098   0.586210

   Means

          A_WELL1   A_MORE1   A_HARD1   A_ENYO1   A_GOOD1   A_QUIC1
         --------  --------  --------  --------  --------  --------
         3.395562   2.773512   1.887636   3.154280   1.660092   3.446636

TI Project: c:\dokum. Categorization variable: timss3  . Group: casaq
```

Covariance Matrix

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
	--------	--------	--------	--------	--------	--------
A_WELL1	0.909677					
A_MORE1	0.161290	1.258065				
A_HARD1	-0.219355	-0.290323	1.167742			
A_ENYO1	0.202258	0.537097	-0.259032	0.833935		
A_GOOD1	-0.113871	-0.124194	0.505484	-0.100903	0.873935	
A_QUIC1	0.189355	0.085484	-0.368710	0.158452	-0.337677	0.589419

Means

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
--------	--------	--------	--------	--------	--------
3.440000	2.800000	1.840000	3.144000	1.584000	3.464000

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Parameter Specifications

LAMBDA-Y EQUALS LAMBDA-Y IN THE FOLLOWING GROUP

PSI EQUALS PSI IN THE FOLLOWING GROUP

THETA-EPS EQUALS THETA-EPS IN THE FOLLOWING GROUP

TAU-Y EQUALS TAU-Y IN THE FOLLOWING GROUP

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Parameter Specifications

LAMBDA-Y

	diff_m	enjoy_m
	--------	--------
A_WELL1	0	0
A_MORE1	0	1
A_HARD1	0	0
A_ENYO1	0	2
A_GOOD1	3	0
A_QUIC1	0	4

PSI

	diff_m	enjoy_m
	--------	--------
diff_m	5	
enjoy_m	6	7

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
	--------	--------	--------	--------	--------	--------
A_WELL1	8					
A_MORE1	0	9				
A_HARD1	0	0	10			
A_ENYO1	0	11	0	12		
A_GOOD1	0	0	0	0	13	
A_QUIC1	0	0	0	0	0	14

TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
--------	--------	--------	--------	--------	--------
15	16	17	18	19	20

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Number of Iterations = 11

LISREL Estimates (Maximum Likelihood)

LAMBDA-Y EQUALS LAMBDA-Y IN THE FOLLOWING GROUP

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	0.423604	
enjoy_m	-0.168589	0.153812

PSI EQUALS PSI IN THE FOLLOWING GROUP

THETA-EPS EQUALS THETA-EPS IN THE FOLLOWING GROUP

TAU-Y EQUALS TAU-Y IN THE FOLLOWING GROUP

LY was written to file model.est

PS was written to file model.est

TE was written to file model.est

TY was written to file model.est

AL was written to file model.est

Group Goodness of Fit Statistics

Contribution to Chi-Square = 31.450730
Percentage Contribution to Chi-Square = 42.614509

Root Mean Square Residual (RMR) = 0.0160351
Standardized RMR = 0.0163637
Goodness of Fit Index (GFI) = 0.996335

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	2.556881	2.323861
A_MORE1	2.076736	0.558116
A_HARD1	1.151361	4.138714
A_ENYO1	4.682364	1.590204
A_GOOD1	0.322495	0.731349
A_QUIC1	0.384225	0.009394

Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	-0.077929	-0.296098
A_MORE1	-0.077922	0.008434
A_HARD1	-0.149296	0.506440
A_ENYO1	0.106234	0.012147
A_GOOD1	0.002680	-0.186269
A_QUIC1	0.038922	0.000691

Standardized Expected Change for LAMBDA-Y

diff_m enjoy_m

A_WELL1	-0.050720	-0.116126
A_MORE1	-0.050715	0.003308
A_HARD1	-0.097169	0.198620
A_ENYO1	0.069142	0.004764
A_GOOD1	0.001744	-0.073053
A_QUIC1	0.025332	0.000271

Completely Standardized Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	-0.066065	-0.151260
A_MORE1	-0.043656	0.002847
A_HARD1	-0.094764	0.193705
A_ENYO1	0.067134	0.004625
A_GOOD1	0.001854	-0.077644
A_QUIC1	0.033082	0.000354

Modification Indices for PSI

	diff_m	enjoy_m
diff_m	0.077692	
enjoy_m	0.800373	0.487749

Expected Change for PSI

	diff_m	enjoy_m
diff_m	0.000747	
enjoy_m	0.000997	0.000769

Standardized Expected Change for PSI

	diff_m	enjoy_m
diff_m	0.001762	
enjoy_m	0.003905	0.004999

Modification Indices for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	30.648367					
A_MORE1	1.004113	0.035581				
A_HARD1	4.600238	13.599360	0.171739			
A_ENYO1	1.094584	0.015747	1.123061	1.036793		
A_GOOD1	13.065676	2.878863	0.467989	2.237952	0.092058	
A_QUIC1	1.058637	0.008237	0.247101	2.283983	0.015489	0.018832

Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	-0.014816					
A_MORE1	-0.013222	-0.000918				
A_HARD1	0.026969	-0.058155	-0.001731			
A_ENYO1	0.012413	-0.000329	0.014722	0.003678		
A_GOOD1	-0.043250	0.024288	0.039405	0.019098	-0.000997	
A_QUIC1	-0.015592	-0.001319	0.007235	0.020689	0.001801	-0.000326

Completely Standardized Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	-0.025138					
A_MORE1	-0.014825	-0.000680				
A_HARD1	0.034259	-0.048821	-0.001646			
A_ENYO1	0.015699	-0.000275	0.013940	0.003468		
A_GOOD1	-0.059875	0.022221	0.040845	0.019709	-0.001126	
A_QUIC1	-0.026522	-0.001483	0.009215	0.026233	0.002499	-0.000555

Modification Indices for TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
0.230055	0.092195	0.005464	0.231150	0.477144	0.021438

Expected Change for TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
-0.001293	-0.001104	0.000249	0.001506	0.002063	0.000372

Modification Indices for ALPHA

diff_m	enjoy_m
0.591906	0.000035

Expected Change for ALPHA

diff_m	enjoy_m
0.049566	-0.000244

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Covariances

Y - ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
diff_m	-0.168589	-0.180525	0.423604	-0.203221	0.482336	-0.230607
enjoy_m	0.153812	0.164701	-0.168589	0.185408	-0.191964	0.210393

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Factor Scores Regressions

ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
diff_m	-0.055216	-0.009970	0.183503	-0.028821	0.390379	-0.110191
enjoy_m	0.115961	0.020939	-0.038312	0.060528	-0.081504	0.231414

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Within Group Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.392189
A_MORE1	- -	0.419953
A_HARD1	0.650848	- -
A_ENYO1	- -	0.472752
A_GOOD1	0.741088	- -
A_QUIC1	- -	0.536459

Correlation Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Within Group Completely Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.510844
A_MORE1	- -	0.361495
A_HARD1	0.634742	- -
A_ENYO1	- -	0.459022
A_GOOD1	0.787667	- -
A_QUIC1	- -	0.700576

Correlation Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.739039					
A_MORE1	- -	0.869322				
A_HARD1	- -	- -	0.597102			
A_ENYO1	- -	0.407659	- -	0.789299		
A_GOOD1	- -	- -	- -	- -	0.379581	
A_QUIC1	- -	- -	- -	- -	- -	0.509194

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Standardized Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Number of Iterations = 11

LISREL Estimates (Maximum Likelihood)

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	1.000000
A_MORE1	- -	1.070795 (0.078156) 13.700670

A_HARD1	1.000000	- -
A_ENYO1	- -	1.205420
		(0.074180)
		16.249951
A_GOOD1	1.138650	- -
	(0.058378)	
	19.504609	
A_QUIC1	- -	1.367859
		(0.074606)
		18.334527

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	0.423604	
enjoy_m	-0.168589	0.153812

PSI

	diff_m	enjoy_m
diff_m	0.423604	
	(0.029666)	
	14.279272	
enjoy_m	-0.168589	0.153812
	(0.011930)	(0.013125)
	-14.132042	11.719188

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.435593					
	(0.013926)					
	31.279893					
A_MORE1	- -	1.173217				
		(0.033212)				
		35.324942				
A_HARD1	- -	- -	0.627789			
			(0.025805)			
			24.328565			
A_ENYO1	- -	0.487749	- -	0.837223		
		(0.023373)		(0.025307)		
		20.867824		33.083046		
A_GOOD1	- -	- -	- -	- -	0.336016	
					(0.027354)	
					12.284123	
A_QUIC1	- -	- -	- -	- -	- -	0.298569
						(0.015520)
						19.237690

Squared Multiple Correlations for Y - Variables

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
0.260961	0.130678	0.402898	0.210701	0.620419	0.490806

TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
3.397422	2.774621	1.885642	3.153849	1.656906	3.447363
(0.014106)	(0.021346)	(0.018840)	(0.018924)	(0.017288)	(0.014070)
240.843536	129.986157	100.085077	166.660824	95.843561	245.018287

LY was written to file model.est

PS was written to file model.est

TE was written to file model.est

TY was written to file model.est

AL was written to file model.est

Global Goodness of Fit Statistics

Degrees of Freedom = 34
Minimum Fit Function Chi-Square = 73.802870 (P = 0.000091)
Normal Theory Weighted Least Squares Chi-Square = 82.770268 (P = 0.000006)
Estimated Non-centrality Parameter (NCP) = 48.770268
90 Percent Confidence Interval for NCP = (25.851882 ; 79.384057)

Minimum Fit Function Value = 0.0249166
Population Discrepancy Function Value (F0) = 0.0164653
90 Percent Confidence Interval for F0 = (0.00872785 ; 0.0268008)
Root Mean Square Error of Approximation (RMSEA) = 0.0311215
90 Percent Confidence Interval for RMSEA = (0.0226584 ; 0.0397054)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.998216

Expected Cross-Validation Index (ECVI) = 0.0414484
90 Percent Confidence Interval for ECVI = (0.0296596 ; 0.0477326)
ECVI for Saturated Model = 0.0141796
ECVI for Independence Model = 1.469536

Chi-Square for Independence Model with 30 Degrees of Freedom = 4340.764452
Independence AIC = 4364.764452
Model AIC = 122.770268
Saturated AIC = 84.000000
Independence CAIC = 4448.695992
Model CAIC = 262.656168
Saturated CAIC = 377.760389

Normed Fit Index (NFI) = 0.982998
Non-Normed Fit Index (NNFI) = 0.991853
Parsimony Normed Fit Index (PNFI) = 1.114064
Comparative Fit Index (CFI) = 0.990767
Incremental Fit Index (IFI) = 0.990758
Relative Fit Index (RFI) = 0.984998

Critical N (CN) = 2250.959448

Group Goodness of Fit Statistics

Contribution to Chi-Square = 42.352139
Percentage Contribution to Chi-Square = 57.385491

Root Mean Square Residual (RMR) = 0.119943

Standardized RMR = 0.156075
Goodness of Fit Index (GFI) = 0.897273

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0.177482	2.323897
A_MORE1	0.000167	0.558026
A_HARD1	1.151420	4.138749
A_ENYO1	1.895950	1.590280
A_GOOD1	0.322498	0.731355
A_QUIC1	2.868426	0.009400

Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0.048521	0.296101
A_MORE1	0.002007	-0.193021
A_HARD1	0.149299	-0.506442
A_ENYO1	0.184198	-0.278006
A_GOOD1	-0.061342	0.186270
A_QUIC1	-0.183014	-0.015825

Standardized Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0.031580	0.116127
A_MORE1	0.001306	-0.075701
A_HARD1	0.097171	-0.198621
A_ENYO1	0.119885	-0.109031
A_GOOD1	-0.039924	0.073053
A_QUIC1	-0.119115	-0.006206

Completely Standardized Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0.041134	0.151261
A_MORE1	0.001124	-0.065163
A_HARD1	0.094767	-0.193706
A_ENYO1	0.116403	-0.105864
A_GOOD1	-0.042434	0.077644
A_QUIC1	-0.155555	-0.008105

Modification Indices for PSI

	diff_m	enjoy_m
diff_m	0.077680	
enjoy_m	0.800343	0.487746

Expected Change for PSI

	diff_m	enjoy_m
diff_m	-0.017086	
enjoy_m	-0.022813	-0.017596

Standardized Expected Change for PSI

	diff_m	enjoy_m
diff_m	-0.040334	
enjoy_m	-0.089372	-0.114401

Modification Indices for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	30.648290					
A_MORE1	0.003109	0.035581				
A_HARD1	0.140814	1.009429	0.171717			
A_ENYO1	0.282349	0.015748	0.219566	1.036836		
A_GOOD1	6.271184	0.004156	0.467905	1.596719	0.092036	
A_QUIC1	5.395092	2.276238	1.216897	- -	3.613584	0.018827

Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.339102					
A_MORE1	-0.003333	0.021010				
A_HARD1	-0.020783	-0.074920	0.039608			
A_ENYO1	0.027341	0.007539	-0.030119	-0.084184		
A_GOOD1	0.122877	0.004267	-0.039401	0.072046	0.022813	
A_QUIC1	-0.095409	-0.085265	-0.057685	- -	-0.087276	0.007452

Completely Standardized Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.575330					
A_MORE1	-0.003737	0.015568				
A_HARD1	-0.026401	-0.062895	0.037672			
A_ENYO1	0.034578	0.006301	-0.028520	-0.079365		
A_GOOD1	0.170112	0.003904	-0.040842	0.074350	0.025770	
A_QUIC1	-0.162293	-0.095850	-0.073468	- -	-0.121139	0.012708

Modification Indices for TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
0.230072	0.092188	0.005465	0.231147	0.477145	0.021441

Expected Change for TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
0.029596	0.025263	-0.005698	-0.034465	-0.047225	-0.008507

Modification Indices for ALPHA

diff_m	enjoy_m
0.591913	0.000035

Expected Change for ALPHA

diff_m	enjoy_m
-0.049566	0.000244

Max. Mod. Index is 30.65 for Element (1, 1) of THETA-EPS in Group 1

Covariance Matrix of Parameter Estimates

	LY 2,2	LY 4,2	LY 5,1	LY 6,2	PS 1,1	PS 2,1
LY 2,2	0.006108					
LY 4,2	0.004006	0.005503				
LY 5,1	0.000000	0.000000	0.003408			
LY 6,2	0.002471	0.002781	0.000000	0.005566		
PS 1,1	0.000000	0.000000	-0.001410	0.000000	0.000880	
PS 2,1	0.000301	0.000339	0.000357	0.000482	-0.000217	0.000142
PS 2,2	-0.000550	-0.000619	0.000000	-0.000785	0.000019	-0.000102
TE 1,1	0.000235	0.000264	0.000000	0.000383	0.000000	0.000035
TE 2,2	-0.000534	-0.000257	0.000000	0.000086	0.000000	-0.000002
TE 3,3	0.000000	0.000000	0.000927	0.000000	-0.000400	0.000097
TE 4,2	-0.000429	-0.000349	0.000000	0.000097	0.000000	-0.000002
TE 4,4	-0.000290	-0.000460	0.000000	0.000109	0.000000	-0.000003
TE 5,5	0.000000	0.000000	-0.001202	0.000000	0.000376	-0.000126
TE 6,6	-0.000011	-0.000013	0.000000	-0.000598	0.000000	-0.000044
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,2	TE 4,4
PS 2,2	0.000172					
TE 1,1	-0.000066	0.000194				
TE 2,2	0.000002	-0.000002	0.001103			
TE 3,3	0.000000	0.000000	0.000000	0.000666		
TE 4,2	0.000002	-0.000002	0.000525	0.000000	0.000546	
TE 4,4	0.000002	-0.000002	0.000253	0.000000	0.000402	0.000640
TE 5,5	0.000000	0.000000	0.000000	-0.000376	0.000000	0.000000
TE 6,6	0.000038	-0.000038	-0.000040	0.000000	-0.000045	-0.000050
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TE 5,5	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 5,5	0.000748					
TE 6,6	0.000000	0.000241				
TY 1	- -	- -	0.000199			
TY 2	- -	- -	0.000056	0.000456		
TY 3	- -	- -	-0.000057	-0.000061	0.000355	
TY 4	- -	- -	0.000063	0.000232	-0.000069	0.000358
TY 5	- -	- -	-0.000065	-0.000069	0.000163	-0.000078
TY 6	- -	- -	0.000071	0.000076	-0.000078	0.000086

Covariance Matrix of Parameter Estimates

	TY 5	TY 6
TY 5	0.000299	
TY 6	-0.000089	0.000198

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Correlation Matrix of Parameter Estimates

	LY 2,2	LY 4,2	LY 5,1	LY 6,2	PS 1,1	PS 2,1
LY 2,2	1.000000					

LY 4,2	0.690981	1.000000				
LY 5,1	0.000000	0.000000	1.000000			
LY 6,2	0.423750	0.502597	0.000000	1.000000		
PS 1,1	0.000000	0.000000	-0.813921	0.000000	1.000000	
PS 2,1	0.322723	0.382772	0.512837	0.541174	-0.612670	1.000000
PS 2,2	-0.535834	-0.635536	0.000000	-0.801595	0.049290	-0.651757
TE 1,1	0.215648	0.255774	0.000000	0.368255	0.000000	0.210398
TE 2,2	-0.205580	-0.104512	0.000000	0.034738	0.000000	-0.005513
TE 3,3	0.000000	0.000000	0.615300	0.000000	-0.522215	0.315548
TE 4,2	-0.234898	-0.201418	0.000000	0.055567	0.000000	-0.008818
TE 4,4	-0.146548	-0.245020	0.000000	0.057774	0.000000	-0.009169
TE 5,5	0.000000	0.000000	-0.752573	0.000000	0.463192	-0.385947
TE 6,6	-0.009300	-0.011031	0.000000	-0.516237	0.000000	-0.240336
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,2	TE 4,4
PS 2,2	1.000000					
TE 1,1	-0.360051	1.000000				
TE 2,2	0.004264	-0.004018	1.000000			
TE 3,3	0.000000	0.000000	0.000000	1.000000		
TE 4,2	0.006820	-0.006428	0.676735	0.000000	1.000000	
TE 4,4	0.007091	-0.006683	0.301505	0.000000	0.679944	1.000000
TE 5,5	0.000000	0.000000	0.000000	-0.532497	0.000000	0.000000
TE 6,6	0.185874	-0.175184	-0.077013	0.000000	-0.123190	-0.128083
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TE 5,5	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 5,5	1.000000					
TE 6,6	0.000000	1.000000				
TY 1	- -	- -	1.000000			
TY 2	- -	- -	0.184667	1.000000		
TY 3	- -	- -	-0.214161	-0.151550	1.000000	
TY 4	- -	- -	0.234488	0.573593	-0.192436	1.000000
TY 5	- -	- -	-0.265758	-0.188062	0.499965	-0.238798
TY 6	- -	- -	0.357885	0.253255	-0.293703	0.321580

Correlation Matrix of Parameter Estimates

	TY 5	TY 6
TY 5	1.000000	
TY 6	-0.364463	1.000000

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Covariances

Y - ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
diff_m	-0.168589	-0.180525	0.423604	-0.203221	0.482336	-0.230607
enjoy_m	0.153812	0.164701	-0.168589	0.185408	-0.191964	0.210393

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Factor Scores Regressions

ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
diff_m	-0.055216	-0.009970	0.183503	-0.028821	0.390379	-0.110191
enjoy_m	0.115961	0.020939	-0.038312	0.060528	-0.081504	0.231414

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Within Group Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.392189
A_MORE1	- -	0.419953
A_HARD1	0.650848	- -
A_ENYO1	- -	0.472752
A_GOOD1	0.741088	- -
A_QUIC1	- -	0.536459

Correlation Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Within Group Completely Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.510844
A_MORE1	- -	0.361495
A_HARD1	0.634742	- -
A_ENYO1	- -	0.459022
A_GOOD1	0.787667	- -
A_QUIC1	- -	0.700576

Correlation Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.739039					
A_MORE1	- -	0.869322				
A_HARD1	- -	- -	0.597102			
A_ENYO1	- -	0.407659	- -	0.789299		
A_GOOD1	- -	- -	- -	- -	0.379581	
A_QUIC1	- -	- -	- -	- -	- -	0.509194

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Standardized Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Common Metric Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.392189
A_MORE1	- -	0.419953
A_HARD1	0.650848	- -
A_ENYO1	- -	0.472752
A_GOOD1	0.741088	- -
A_QUIC1	- -	0.536459

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Common Metric Completely Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.510844
A_MORE1	- -	0.361495
A_HARD1	0.634742	- -
A_ENYO1	- -	0.459022
A_GOOD1	0.787667	- -
A_QUIC1	- -	0.700576

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.739039					
A_MORE1	- -	0.869322				
A_HARD1	- -	- -	0.597102			
A_ENYO1	- -	0.407659	- -	0.789299		
A_GOOD1	- -	- -	- -	- -	0.379581	
A_QUIC1	- -	- -	- -	- -	- -	0.509194

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Common Metric Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.392189
A_MORE1	- -	0.419953
A_HARD1	0.650848	- -
A_ENYO1	- -	0.472752
A_GOOD1	0.741088	- -
A_QUIC1	- -	0.536459

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Common Metric Completely Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.510844
A_MORE1	- -	0.361495
A_HARD1	0.634742	- -
A_ENYO1	- -	0.459022
A_GOOD1	0.787667	- -
A_QUIC1	- -	0.700576

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.660474	1.000000

PSI

```
          diff_m    enjoy_m
         --------   --------
 diff_m   1.000000
enjoy_m  -0.660474   1.000000

      THETA-EPS

         A_WELL1    A_MORE1    A_HARD1    A_ENYO1    A_GOOD1    A_QUIC1
        --------   --------   --------   --------   --------   --------
 A_WELL1   0.739039
 A_MORE1     - -      0.869322
 A_HARD1     - -        - -      0.597102
 A_ENYO1     - -      0.407659     - -      0.789299
 A_GOOD1     - -        - -        - -        - -      0.379581
 A_QUIC1     - -        - -        - -        - -        - -      0.509194

                           Time used:    0.160 Seconds
```

Two group model (attitudes towards mathematics) – every arameter free over groups

```
                              DATE: 12/ 3/2004
                                TIME: 10:11


                              L I S R E L  8.54

                                   BY

                         Karl G. J"reskog & Dag S"rbom



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 The following lines were read from file model.lis:

 TI Project: c:\dokum. Categorization variable: timss3  . Group: papi
 TI title
 TI dve bazi 18.11
 DA NI=6 NO=2839 NG=2 MA=CM
 LA
 'A_WELL1' 'A_MORE1' 'A_HARD1' 'A_ENYO1' 'A_GOOD1' 'A_QUIC1'
 RA FI=timss1.raw
 MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
 LE
 'diff_m' 'enjoy_m'
 VA 1.000 LY(1,2) LY(3,1)
 FR LY(2,2) LY(4,2) LY(5,1) LY(6,2)
 FR PS(1,1) PS(2,1) PS(2,2)
 FR TE(1,1) TE(2,2) TE(3,3) TE(4,2) TE(4,4)
 FR TE(5,5) TE(6,6)
 FR TY(1) TY(2) TY(3) TY(4) TY(5)
 FR TY(6)
 OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6 FM C
 LY=model.est PS=model.est TE=model.est C
```

```
TY=model.est AL=model.est  GF=model.gft C
PV=model.pvt C
SV=model.svt

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

                    Number of Input Variables  6
                    Number of Y - Variables    6
                    Number of X - Variables    0
                    Number of ETA - Variables  2
                    Number of KSI - Variables  0
                    Number of Observations  2839
                    Number of Groups           2

TI Project: c:\dokum. Categorization variable: timss3  . Group: casaq
TI title
TI dve bazi 18.11
DA NI=6 NO=125 NG=2 MA=CM
LA
'A_WELL1' 'A_MORE1' 'A_HARD1' 'A_ENYO1' 'A_GOOD1' 'A_QUIC1'
RA FI=timss2.raw
MO NY=6 NE=2 LY=FU,FI PS=SY,FI TE=SY,FI TY=DI,FI AL=DI,FI
LE
'diff_m' 'enjoy_m'
VA 1.000 LY(1,2) LY(3,1)
FR LY(2,2) LY(4,2) LY(5,1) LY(6,2)
FR PS(1,1) PS(2,1) PS(2,2)
FR TE(1,1) TE(2,2) TE(3,3) TE(4,2) TE(4,4)
FR TE(5,5) TE(6,6)
FR TY(1) TY(2) TY(3) TY(4) TY(5)
FR TY(6)
OU ME=ML AD=OFF MI SS SC EF VA FS PC  ND=6  ND=6 FM C
LY=model.est PS=model.est TE=model.est C
TY=model.est AL=model.est  GF=model.gft C
PV=model.pvt C
SV=model.svt

TI Project: c:\dokum. Categorization variable: timss3  . Group: casaq

                    Number of Input Variables  6
                    Number of Y - Variables    6
                    Number of X - Variables    0
                    Number of ETA - Variables  2
                    Number of KSI - Variables  0
                    Number of Observations   125
                    Number of Groups           2

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

      Covariance Matrix

          A_WELL1    A_MORE1    A_HARD1    A_ENYO1    A_GOOD1    A_QUIC1
         --------   --------   --------   --------   --------   --------
 A_WELL1   0.575329
 A_MORE1   0.158332   1.353548
 A_HARD1  -0.154974  -0.234056   1.046214
 A_ENYO1   0.191594   0.692812  -0.203236   1.070622
 A_GOOD1  -0.213278  -0.186244   0.481173  -0.203355   0.885479
 A_QUIC1   0.205577   0.232976  -0.224286   0.265812  -0.261098   0.586210

      Means

          A_WELL1    A_MORE1    A_HARD1    A_ENYO1    A_GOOD1    A_QUIC1
         --------   --------   --------   --------   --------   --------
         3.395562   2.773512   1.887636   3.154280   1.660092   3.446636

TI Project: c:\dokum. Categorization variable: timss3  . Group: casaq
```

Covariance Matrix

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.909677					
A_MORE1	0.161290	1.258065				
A_HARD1	-0.219355	-0.290323	1.167742			
A_ENYO1	0.202258	0.537097	-0.259032	0.833935		
A_GOOD1	-0.113871	-0.124194	0.505484	-0.100903	0.873935	
A_QUIC1	0.189355	0.085484	-0.368710	0.158452	-0.337677	0.589419

Means

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
3.440000	2.800000	1.840000	3.144000	1.584000	3.464000

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Parameter Specifications

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0	0
A_MORE1	0	1
A_HARD1	0	0
A_ENYO1	0	2
A_GOOD1	3	0
A_QUIC1	0	4

PSI

	diff_m	enjoy_m
diff_m	5	
enjoy_m	6	7

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	8					
A_MORE1	0	9				
A_HARD1	0	0	10			
A_ENYO1	0	11	0	12		
A_GOOD1	0	0	0	0	13	
A_QUIC1	0	0	0	0	0	14

TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
15	16	17	18	19	20

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Parameter Specifications

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0	0
A_MORE1	0	21
A_HARD1	0	0
A_ENYO1	0	22
A_GOOD1	23	0

```
A_QUIC1       0       24

      PSI

          diff_m   enjoy_m
        --------  --------
 diff_m       25
enjoy_m       26       27

      THETA-EPS

         A_WELL1   A_MORE1   A_HARD1   A_ENYO1   A_GOOD1   A_QUIC1
        --------  --------  --------  --------  --------  --------
A_WELL1       28
A_MORE1        0        29
A_HARD1        0         0        30
A_ENYO1        0        31         0        32
A_GOOD1        0         0         0         0        33
A_QUIC1        0         0         0         0         0        34

      TAU-Y

         A_WELL1   A_MORE1   A_HARD1   A_ENYO1   A_GOOD1   A_QUIC1
        --------  --------  --------  --------  --------  --------
              35        36        37        38        39        40
```

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Number of Iterations = 14

LISREL Estimates (Maximum Likelihood)

```
      LAMBDA-Y

          diff_m   enjoy_m
        --------  --------
 A_WELL1     - -   1.000000

 A_MORE1     - -   1.082197
                  (0.079322)
                   13.643046

 A_HARD1  1.000000     - -

 A_ENYO1     - -   1.215296
                  (0.075308)
                   16.137570

 A_GOOD1  1.165219     - -
        (0.061902)
         18.823692

 A_QUIC1     - -   1.355391
                  (0.074521)
                   18.187966


      Covariance Matrix of ETA

          diff_m   enjoy_m
        --------  --------
 diff_m  0.412946
enjoy_m -0.165559  0.155609
```

PSI

	diff_m	enjoy_m
diff_m	0.412946 (0.029941) 13.792223	
enjoy_m	-0.165559 (0.012019) -13.775233	0.155609 (0.013307) 11.693404

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.419720 (0.013861) 30.281565					
A_MORE1	- -	1.171307 (0.033975) 34.475038				
A_HARD1	- -	- -	0.633268 (0.026274) 24.102879			
A_ENYO1	- -	0.488158 (0.024000) 20.340137	- -	0.840797 (0.026052) 32.274035		
A_GOOD1	- -	- -	- -	- -	0.324807 (0.028738) 11.302198	
A_QUIC1	- -	- -	- -	- -	- -	0.300344 (0.015703) 19.125951

Squared Multiple Correlations for Y - Variables

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
0.270469	0.134640	0.394705	0.214665	0.633185	0.487651

TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
3.395562	2.773512	1.887636	3.154280	1.660092	3.446636
(0.014238)	(0.021839)	(0.019200)	(0.019423)	(0.017664)	(0.014372)
238.484222	126.998746	98.313746	162.400845	93.982977	239.814168

LY was written to file model.est

PS was written to file model.est

TE was written to file model.est

TY was written to file model.est

AL was written to file model.est

Group Goodness of Fit Statistics

Contribution to Chi-Square = 29.626200

Percentage Contribution to Chi-Square = 76.193247

Root Mean Square Residual (RMR) = 0.0158359
Standardized RMR = 0.0153855
Goodness of Fit Index (GFI) = 0.996519

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	3.847656	- -
A_MORE1	1.514618	- -
A_HARD1	- -	- -
A_ENYO1	6.386976	- -
A_GOOD1	- -	- -
A_QUIC1	0.010808	- -

Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	-0.100811	- -
A_MORE1	-0.068791	- -
A_HARD1	- -	- -
A_ENYO1	0.129259	- -
A_GOOD1	- -	- -
A_QUIC1	0.007534	- -

Standardized Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	-0.064782	- -
A_MORE1	-0.044206	- -
A_HARD1	- -	- -
A_ENYO1	0.083063	- -
A_GOOD1	- -	- -
A_QUIC1	0.004842	- -

Completely Standardized Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	-0.085408	- -
A_MORE1	-0.037996	- -
A_HARD1	- -	- -
A_ENYO1	0.080277	- -
A_GOOD1	- -	- -
A_QUIC1	0.006324	- -

No Non-Zero Modification Indices for PSI

Modification Indices for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	1.313354	- -				
A_HARD1	4.630823	13.835441	- -			
A_ENYO1	0.704357	- -	0.908718	- -		
A_GOOD1	11.733759	3.106239	- -	2.381805	- -	
A_QUIC1	3.602219	0.014863	0.000078	2.409405	0.007099	- -

Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	-0.014985	- -				
A_HARD1	0.026723	-0.058546	- -			
A_ENYO1	0.009940	- -	0.013262	- -		
A_GOOD1	-0.040878	0.025251	- -	0.019804	- -	
A_QUIC1	-0.030000	-0.001786	-0.000129	0.021606	0.001241	- -

Completely Standardized Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	-0.016981	- -				
A_HARD1	0.034444	-0.049199	- -			
A_ENYO1	0.012665	- -	0.012530	- -		
A_GOOD1	-0.057272	0.023065	- -	0.020339	- -	
A_QUIC1	-0.051658	-0.002005	-0.000164	0.027273	0.001722	- -

No Non-Zero Modification Indices for TAU-Y

No Non-Zero Modification Indices for ALPHA

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Covariances

Y - ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
diff_m	-0.165559	-0.179167	0.412946	-0.201203	0.481173	-0.224397
enjoy_m	0.155609	0.168399	-0.165559	0.189111	-0.192912	0.210911

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Factor Scores Regressions

ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
diff_m	-0.054714	-0.009741	0.174515	-0.027538	0.396463	-0.103634
enjoy_m	0.121559	0.021641	-0.036263	0.061181	-0.082383	0.230246

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Within Group Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.394473
A_MORE1	- -	0.426897
A_HARD1	0.642609	- -
A_ENYO1	- -	0.479401
A_GOOD1	0.748780	- -
A_QUIC1	- -	0.534665

Correlation Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.653113	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.653113	1.000000

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Within Group Completely Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.520066
A_MORE1	- -	0.366933
A_HARD1	0.628256	- -
A_ENYO1	- -	0.463320
A_GOOD1	0.795729	- -
A_QUIC1	- -	0.698320

Correlation Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.653113	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.653113	1.000000

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.729531					
A_MORE1	- -	0.865360				
A_HARD1	- -	- -	0.605295			
A_ENYO1	- -	0.405513	- -	0.785335		
A_GOOD1	- -	- -	- -	- -	0.366815	
A_QUIC1	- -	- -	- -	- -	- -	0.512349

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Standardized Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Number of Iterations = 14

LISREL Estimates (Maximum Likelihood)

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	1.000000
A_MORE1	- -	0.758081 (0.426078) 1.779209

```
A_HARD1   1.000000    - -

A_ENYO1    - -      0.933281
                  (0.398636)
                   2.341188

A_GOOD1   0.821176    - -
        (0.158006)
         5.197104

A_QUIC1    - -      1.749619
                  (0.600082)
                   2.915632


       Covariance Matrix of ETA

            diff_m    enjoy_m
          --------   --------
 diff_m   0.615561
enjoy_m  -0.218340   0.106545

       PSI

            diff_m    enjoy_m
          --------   --------
 diff_m   0.615561
        (0.167379)
         3.677635

enjoy_m  -0.218340   0.106545
        (0.080887) (0.064893)
        -2.699333   1.641876


       THETA-EPS

           A_WELL1    A_MORE1    A_HARD1    A_ENYO1    A_GOOD1    A_QUIC1
          --------   --------   --------   --------   --------   --------
A_WELL1   0.803132
        (0.108033)
         7.434118

A_MORE1    - -      1.196834
                  (0.155396)
                   7.701830

A_HARD1    - -        - -      0.552181
                             (0.125927)
                              4.384926

A_ENYO1    - -      0.461716    - -      0.741133
                  (0.098470)           (0.099363)
                   4.688901             7.458853

A_GOOD1    - -        - -        - -        - -      0.458844
                                                   (0.091490)
                                                    5.015265

A_QUIC1    - -        - -        - -        - -        - -      0.263266
                                                              (0.089008)
                                                               2.957791
```

Squared Multiple Correlations for Y - Variables

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
0.117124	0.048670	0.527138	0.111283	0.474968	0.553347

TAU-Y

A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
3.440000	2.800000	1.840000	3.144000	1.584000	3.464000
(0.085651)	(0.100726)	(0.097043)	(0.082008)	(0.083952)	(0.068945)
40.162947	27.798246	18.960741	38.337799	18.868022	50.243107

LY was written to file model.est

PS was written to file model.est

TE was written to file model.est

TY was written to file model.est

AL was written to file model.est

Global Goodness of Fit Statistics

Degrees of Freedom = 14
Minimum Fit Function Chi-Square = 38.882973 (P = .38022674D-03)
Normal Theory Weighted Least Squares Chi-Square = 39.306538 (P = .32699793D-03)
Estimated Non-centrality Parameter (NCP) = 25.306538
90 Percent Confidence Interval for NCP = (10.299235 ; 47.952263)

Minimum Fit Function Value = 0.0131273
Population Discrepancy Function Value (F0) = 0.00854373
90 Percent Confidence Interval for F0 = (0.00347712 ; 0.0161892)
Root Mean Square Error of Approximation (RMSEA) = 0.0349361
90 Percent Confidence Interval for RMSEA = (0.0222875 ; 0.0480909)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.915912

Expected Cross-Validation Index (ECVI) = 0.0402790
90 Percent Confidence Interval for ECVI = (0.0311611 ; 0.0438731)
ECVI for Saturated Model = 0.0141796
ECVI for Independence Model = 1.469536

Chi-Square for Independence Model with 30 Degrees of Freedom = 4340.764452
Independence AIC = 4364.764452
Model AIC = 119.306538
Saturated AIC = 84.000000
Independence CAIC = 4448.695992
Model CAIC = 399.078337
Saturated CAIC = 377.760389

Normed Fit Index (NFI) = 0.991042
Non-Normed Fit Index (NNFI) = 0.987631
Parsimony Normed Fit Index (PNFI) = 0.462486
Comparative Fit Index (CFI) = 0.994228
Incremental Fit Index (IFI) = 0.994249
Relative Fit Index (RFI) = 0.980805

Critical N (CN) = 2221.102353

Group Goodness of Fit Statistics

Contribution to Chi-Square = 9.256774
Percentage Contribution to Chi-Square = 23.806753

Root Mean Square Residual (RMR) = 0.0481248

Standardized RMR = 0.0492749
Goodness of Fit Index (GFI) = 0.974933

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	1.301910	- -
A_MORE1	2.155427	- -
A_HARD1	- -	- -
A_ENYO1	0.971673	- -
A_GOOD1	- -	- -
A_QUIC1	2.553515	- -

Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0.675207	- -
A_MORE1	-0.672892	- -
A_HARD1	- -	- -
A_ENYO1	0.415843	- -
A_GOOD1	- -	- -
A_QUIC1	-2.658480	- -

Standardized Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0.529752	- -
A_MORE1	-0.527935	- -
A_HARD1	- -	- -
A_ENYO1	0.326260	- -
A_GOOD1	- -	- -
A_QUIC1	-2.085782	- -

Completely Standardized Expected Change for LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	0.555429	- -
A_MORE1	-0.470684	- -
A_HARD1	- -	- -
A_ENYO1	0.357271	- -
A_GOOD1	- -	- -
A_QUIC1	-2.716794	- -

No Non-Zero Modification Indices for PSI

Modification Indices for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	0.048918	- -				
A_HARD1	0.098327	1.688058	- -			
A_ENYO1	1.560546	- -	0.217238	- -		
A_GOOD1	1.728338	0.044446	- -	2.100231	- -	
A_QUIC1	0.021478	2.404232	2.429266	0.091291	5.109744	- -

Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	0.017497	- -				
A_HARD1	-0.026043	-0.102174	- -			
A_ENYO1	0.079303	- -	-0.030733	- -		
A_GOOD1	0.093102	-0.014418	- -	0.082256	- -	
A_QUIC1	0.012453	-0.100537	0.185625	0.018144	-0.223188	- -

Completely Standardized Expected Change for THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	- -					
A_MORE1	0.016355	- -				
A_HARD1	-0.025269	-0.084297	- -			
A_ENYO1	0.091050	- -	-0.031143	- -		
A_GOOD1	0.104418	-0.013751	- -	0.096352	- -	
A_QUIC1	0.017007	-0.116752	0.223744	0.025879	-0.310970	- -

No Non-Zero Modification Indices for TAU-Y

No Non-Zero Modification Indices for ALPHA

Max. Mod. Index is 13.84 for Element (3, 2) of THETA-EPS in Group 1

Covariance Matrix of Parameter Estimates

	LY 2,2	LY 4,2	LY 5,1	LY 6,2	PS 1,1	PS 2,1
LY 2,2	0.006292					
LY 4,2	0.004123	0.005671				
LY 5,1	0.000000	0.000000	0.003832			
LY 6,2	0.002488	0.002794	0.000000	0.005553		
PS 1,1	0.000000	0.000000	-0.001520	0.000000	0.000896	
PS 2,1	0.000300	0.000336	0.000395	0.000468	-0.000225	0.000144
PS 2,2	-0.000564	-0.000633	0.000000	-0.000790	0.000019	-0.000102
TE 1,1	0.000244	0.000274	0.000000	0.000389	0.000000	0.000035
TE 2,2	-0.000565	-0.000275	0.000000	0.000087	0.000000	-0.000003
TE 3,3	0.000000	0.000000	0.001000	0.000000	-0.000408	0.000103
TE 4,2	-0.000455	-0.000372	0.000000	0.000098	0.000000	-0.000003
TE 4,4	-0.000309	-0.000490	0.000000	0.000110	0.000000	-0.000004
TE 5,5	0.000000	0.000000	-0.001357	0.000000	0.000409	-0.000140
TE 6,6	-0.000014	-0.000015	0.000000	-0.000605	0.000000	-0.000044
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -
LY 2,2	- -	- -	- -	- -	- -	- -
LY 4,2	- -	- -	- -	- -	- -	- -
LY 5,1	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,2	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,2	TE 4,4
PS 2,2	0.000177					
TE 1,1	-0.000068	0.000192				
TE 2,2	0.000003	-0.000003	0.001154			
TE 3,3	0.000000	0.000000	0.000000	0.000690		
TE 4,2	0.000003	-0.000003	0.000553	0.000000	0.000576	
TE 4,4	0.000003	-0.000003	0.000268	0.000000	0.000426	0.000679
TE 5,5	0.000000	0.000000	0.000000	-0.000409	0.000000	0.000000
TE 6,6	0.000039	-0.000039	-0.000041	0.000000	-0.000046	-0.000052
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -
LY 2,2	- -	- -	- -	- -	- -	- -
LY 4,2	- -	- -	- -	- -	- -	- -
LY 5,1	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,2	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TE 5,5	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 5,5	0.000826					
TE 6,6	0.000000	0.000247				
TY 1	- -	- -	0.000203			
TY 2	- -	- -	0.000059	0.000477		
TY 3	- -	- -	-0.000058	-0.000063	0.000369	
TY 4	- -	- -	0.000067	0.000244	-0.000071	0.000377
TY 5	- -	- -	-0.000068	-0.000074	0.000170	-0.000083
TY 6	- -	- -	0.000074	0.000080	-0.000079	0.000090
LY 2,2	- -	- -	- -	- -	- -	- -
LY 4,2	- -	- -	- -	- -	- -	- -
LY 5,1	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,2	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TY 5	TY 6	LY 2,2	LY 4,2	LY 5,1	LY 6,2
TY 5	0.000312					
TY 6	-0.000092	0.000207				
LY 2,2	- -	- -	0.181542			
LY 4,2	- -	- -	0.113879	0.158910		
LY 5,1	- -	- -	0.000000	0.000000	0.024966	
LY 6,2	- -	- -	0.117610	0.144790	0.000000	0.360099
PS 1,1	- -	- -	0.000000	0.000000	-0.017865	0.000000
PS 2,1	- -	- -	0.014675	0.018067	0.002974	0.040014
PS 2,2	- -	- -	-0.014322	-0.017632	0.000000	-0.034270
TE 1,1	- -	- -	0.004502	0.005543	0.000000	0.011606
TE 2,2	- -	- -	-0.006462	-0.002618	0.000000	0.000696
TE 3,3	- -	- -	0.000000	0.000000	0.010552	0.000000
TE 4,2	- -	- -	-0.005286	-0.003678	0.000000	0.000857
TE 4,4	- -	- -	-0.003223	-0.005089	0.000000	0.001055
TE 5,5	- -	- -	0.000000	0.000000	-0.007115	0.000000
TE 6,6	- -	- -	-0.000006	-0.000007	0.000000	-0.021919
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	PS 1,1	PS 2,1	PS 2,2	TE 1,1	TE 2,2	TE 3,3
PS 1,1	0.028016					
PS 2,1	-0.005369	0.006543				
PS 2,2	0.000769	-0.004511	0.004211			
TE 1,1	0.000000	0.001307	-0.001268	0.011671		
TE 2,2	0.000000	0.000006	-0.000001	0.000001	0.024148	
TE 3,3	-0.010940	0.001257	0.000000	0.000000	0.000000	0.015858
TE 4,2	0.000000	0.000007	-0.000001	0.000001	0.009768	0.000000
TE 4,4	0.000000	0.000009	-0.000002	0.000002	0.003960	0.000000
TE 5,5	0.003291	-0.000848	0.000000	0.000000	0.000000	-0.003291
TE 6,6	0.000000	-0.002259	0.000447	-0.000447	-0.000256	0.000000
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Covariance Matrix of Parameter Estimates

	TE 4,2	TE 4,4	TE 5,5	TE 6,6	TY 1	TY 2
TE 4,2	0.009696					
TE 4,4	0.006252	0.009873				
TE 5,5	0.000000	0.000000	0.008370			
TE 6,6	-0.000315	-0.000388	0.000000	0.007922		
TY 1	- -	- -	- -	- -	0.007336	
TY 2	- -	- -	- -	- -	0.000651	0.010146
TY 3	- -	- -	- -	- -	-0.001761	-0.001335
TY 4	- -	- -	- -	- -	0.000802	0.004331
TY 5	- -	- -	- -	- -	-0.001446	-0.001096
TY 6	- -	- -	- -	- -	0.001503	0.001140

Covariance Matrix of Parameter Estimates

	TY 3	TY 4	TY 5	TY 6
TY 3	0.009417			
TY 4	-0.001643	0.006725		
TY 5	0.004076	-0.001349	0.007048	

TY 6	-0.003081	0.001403	-0.002530	0.004753

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Correlation Matrix of Parameter Estimates

	LY 2,2	LY 4,2	LY 5,1	LY 6,2	PS 1,1	PS 2,1
LY 2,2	1.000000					
LY 4,2	0.690270	1.000000				
LY 5,1	0.000000	0.000000	1.000000			
LY 6,2	0.420928	0.497891	0.000000	1.000000		
PS 1,1	0.000000	0.000000	-0.819998	0.000000	1.000000	
PS 2,1	0.314162	0.371604	0.531152	0.522977	-0.625732	1.000000
PS 2,2	-0.534228	-0.631908	0.000000	-0.796480	0.048481	-0.637060
TE 1,1	0.221762	0.262310	0.000000	0.376558	0.000000	0.208683
TE 2,2	-0.209801	-0.107406	0.000000	0.034371	0.000000	-0.006876
TE 3,3	0.000000	0.000000	0.614709	0.000000	-0.518259	0.326504
TE 4,2	-0.238946	-0.205993	0.000000	0.054642	0.000000	-0.010932
TE 4,4	-0.149341	-0.249565	0.000000	0.056529	0.000000	-0.011309
TE 5,5	0.000000	0.000000	-0.763029	0.000000	0.474843	-0.405284
TE 6,6	-0.010924	-0.012922	0.000000	-0.516677	0.000000	-0.231837
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -
LY 2,2	- -	- -	- -	- -	- -	- -
LY 4,2	- -	- -	- -	- -	- -	- -
LY 5,1	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,2	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	PS 2,2	TE 1,1	TE 2,2	TE 3,3	TE 4,2	TE 4,4
PS 2,2	1.000000					
TE 1,1	-0.368497	1.000000				
TE 2,2	0.005564	-0.005342	1.000000			
TE 3,3	0.000000	0.000000	0.000000	1.000000		
TE 4,2	0.008846	-0.008493	0.678000	0.000000	1.000000	
TE 4,4	0.009152	-0.008786	0.302961	0.000000	0.681165	1.000000
TE 5,5	0.000000	0.000000	0.000000	-0.541117	0.000000	0.000000
TE 6,6	0.187602	-0.180114	-0.077465	0.000000	-0.123152	-0.127405
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -
LY 2,2	- -	- -	- -	- -	- -	- -
LY 4,2	- -	- -	- -	- -	- -	- -
LY 5,1	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -

PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,2	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TE 5,5	TE 6,6	TY 1	TY 2	TY 3	TY 4
TE 5,5	1.000000					
TE 6,6	0.000000	1.000000				
TY 1	- -	- -	1.000000			
TY 2	- -	- -	0.190829	1.000000		
TY 3	- -	- -	-0.213395	-0.150561	1.000000	
TY 4	- -	- -	0.240957	0.575521	-0.190110	1.000000
TY 5	- -	- -	-0.270279	-0.190695	0.499922	-0.240788
TY 6	- -	- -	0.363173	0.256237	-0.286536	0.323546
LY 2,2	- -	- -	- -	- -	- -	- -
LY 4,2	- -	- -	- -	- -	- -	- -
LY 5,1	- -	- -	- -	- -	- -	- -
LY 6,2	- -	- -	- -	- -	- -	- -
PS 1,1	- -	- -	- -	- -	- -	- -
PS 2,1	- -	- -	- -	- -	- -	- -
PS 2,2	- -	- -	- -	- -	- -	- -
TE 1,1	- -	- -	- -	- -	- -	- -
TE 2,2	- -	- -	- -	- -	- -	- -
TE 3,3	- -	- -	- -	- -	- -	- -
TE 4,2	- -	- -	- -	- -	- -	- -
TE 4,4	- -	- -	- -	- -	- -	- -
TE 5,5	- -	- -	- -	- -	- -	- -
TE 6,6	- -	- -	- -	- -	- -	- -
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TY 5	TY 6	LY 2,2	LY 4,2	LY 5,1	LY 6,2
TY 5	1.000000					
TY 6	-0.362918	1.000000				
LY 2,2	- -	- -	1.000000			
LY 4,2	- -	- -	0.670468	1.000000		
LY 5,1	- -	- -	0.000000	0.000000	1.000000	
LY 6,2	- -	- -	0.459984	0.605274	0.000000	1.000000
PS 1,1	- -	- -	0.000000	0.000000	-0.675514	0.000000
PS 2,1	- -	- -	0.425809	0.560305	0.232673	0.824377
PS 2,2	- -	- -	-0.517995	-0.681609	0.000000	-0.880059
TE 1,1	- -	- -	0.097809	0.128703	0.000000	0.179028
TE 2,2	- -	- -	-0.097594	-0.042255	0.000000	0.007464
TE 3,3	- -	- -	0.000000	0.000000	0.530315	0.000000
TE 4,2	- -	- -	-0.125998	-0.093701	0.000000	0.014501
TE 4,4	- -	- -	-0.076117	-0.128480	0.000000	0.017692
TE 5,5	- -	- -	0.000000	0.000000	-0.492214	0.000000
TE 6,6	- -	- -	-0.000145	-0.000191	0.000000	-0.410370
TY 1	- -	- -	- -	- -	- -	- -

TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	PS 1,1	PS 2,1	PS 2,2	TE 1,1	TE 2,2	TE 3,3
PS 1,1	1.000000					
PS 2,1	-0.396577	1.000000				
PS 2,2	0.070791	-0.859375	1.000000			
TE 1,1	0.000000	0.149601	-0.180816	1.000000		
TE 2,2	0.000000	0.000482	-0.000119	0.000071	1.000000	
TE 3,3	-0.519026	0.123390	0.000000	0.000000	0.000000	1.000000
TE 4,2	0.000000	0.000936	-0.000231	0.000139	0.638333	0.000000
TE 4,4	0.000000	0.001142	-0.000282	0.000169	0.256468	0.000000
TE 5,5	0.214877	-0.114525	0.000000	0.000000	0.000000	-0.285610
TE 6,6	0.000000	-0.313721	0.077338	-0.046455	-0.018496	0.000000
TY 1	- -	- -	- -	- -	- -	- -
TY 2	- -	- -	- -	- -	- -	- -
TY 3	- -	- -	- -	- -	- -	- -
TY 4	- -	- -	- -	- -	- -	- -
TY 5	- -	- -	- -	- -	- -	- -
TY 6	- -	- -	- -	- -	- -	- -

Correlation Matrix of Parameter Estimates

	TE 4,2	TE 4,4	TE 5,5	TE 6,6	TY 1	TY 2
TE 4,2	1.000000					
TE 4,4	0.638986	1.000000				
TE 5,5	0.000000	0.000000	1.000000			
TE 6,6	-0.035934	-0.043841	0.000000	1.000000		
TY 1	- -	- -	- -	- -	1.000000	
TY 2	- -	- -	- -	- -	0.075501	1.000000
TY 3	- -	- -	- -	- -	-0.211844	-0.136560
TY 4	- -	- -	- -	- -	0.114166	0.524366
TY 5	- -	- -	- -	- -	-0.201088	-0.129627
TY 6	- -	- -	- -	- -	0.254579	0.164108

Correlation Matrix of Parameter Estimates

	TY 3	TY 4	TY 5	TY 6
TY 3	1.000000			
TY 4	-0.206494	1.000000		
TY 5	0.500373	-0.196009	1.000000	
TY 6	-0.460460	0.248149	-0.437081	1.000000

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Covariances

Y - ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
diff_m	-0.218340	-0.165520	0.615561	-0.203773	0.505484	-0.382013
enjoy_m	0.106545	0.080770	-0.218340	0.099437	-0.179296	0.186414

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Factor Scores Regressions

ETA

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
diff_m	-0.050840	-0.007934	0.293903	-0.046475	0.290440	-0.271357
enjoy_m	0.038492	0.006007	-0.073945	0.035187	-0.073074	0.205451

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Within Group Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.326413
A_MORE1	- -	0.247448
A_HARD1	0.784577	- -
A_ENYO1	- -	0.304635
A_GOOD1	0.644276	- -
A_QUIC1	- -	0.571099

Correlation Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.852572	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.852572	1.000000

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Within Group Completely Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.342235
A_MORE1	- -	0.220613
A_HARD1	0.726043	- -
A_ENYO1	- -	0.333591
A_GOOD1	0.689179	- -
A_QUIC1	- -	0.743873

Correlation Matrix of ETA

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.852572	1.000000

PSI

	diff_m	enjoy_m
diff_m	1.000000	
enjoy_m	-0.852572	1.000000

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.882876					
A_MORE1	- -	0.951330				
A_HARD1	- -	- -	0.472862			
A_ENYO1	- -	0.450772	- -	0.888717		
A_GOOD1	- -	- -	- -	- -	0.525032	
A_QUIC1	- -	- -	- -	- -	- -	0.446653

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Standardized Total and Indirect Effects

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Common Metric Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.391861
A_MORE1	- -	0.424070
A_HARD1	0.649175	- -
A_ENYO1	- -	0.476226
A_GOOD1	0.756431	- -
A_QUIC1	- -	0.531124

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	0.979873	
enjoy_m	-0.650817	1.013376

PSI

	diff_m	enjoy_m
diff_m	0.979873	
enjoy_m	-0.650817	1.013376

TI Project: c:\dokum. Categorization variable: timss3 . Group: papi

Common Metric Completely Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.510451
A_MORE1	- -	0.365042
A_HARD1	0.633138	- -
A_ENYO1	- -	0.462396
A_GOOD1	0.804080	- -
A_QUIC1	- -	0.693617

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	0.979873	
enjoy_m	-0.650817	1.013376

PSI

	diff_m	enjoy_m
diff_m	0.979873	
enjoy_m	-0.650817	1.013376

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	0.712204					
A_MORE1	- -	0.867924				
A_HARD1	- -	- -	0.602365			
A_ENYO1	- -	0.408006	- -	0.792671		
A_GOOD1	- -	- -	- -	- -	0.367015	
A_QUIC1	- -	- -	- -	- -	- -	0.512231

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Common Metric Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.391861
A_MORE1	- -	0.297062
A_HARD1	0.649175	- -
A_ENYO1	- -	0.365716
A_GOOD1	0.533087	- -
A_QUIC1	- -	0.685607

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	1.460652	
enjoy_m	-0.858303	0.693860

PSI

	diff_m	enjoy_m
diff_m	1.460652	
enjoy_m	-0.858303	0.693860

TI Project: c:\dokum. Categorization variable: timss3 . Group: casaq

Common Metric Completely Standardized Solution

LAMBDA-Y

	diff_m	enjoy_m
A_WELL1	- -	0.510451
A_MORE1	- -	0.255713
A_HARD1	0.633138	- -
A_ENYO1	- -	0.355095
A_GOOD1	0.566667	- -
A_QUIC1	- -	0.895362

Covariance Matrix of ETA

	diff_m	enjoy_m
diff_m	1.460652	
enjoy_m	-0.858303	0.693860

PSI

	diff_m	enjoy_m
diff_m	1.460652	
enjoy_m	-0.858303	0.693860

THETA-EPS

	A_WELL1	A_MORE1	A_HARD1	A_ENYO1	A_GOOD1	A_QUIC1
A_WELL1	1.362797					
A_MORE1	- -	0.886839				
A_HARD1	- -	- -	0.525235			
A_ENYO1	- -	0.385905	- -	0.698712		
A_GOOD1	- -	- -	- -	- -	0.518471	
A_QUIC1	- -	- -	- -	- -	- -	0.448995

Time used: 0.150 Seconds