

Helena Thuneberg

Is a Majority Enough?

Psychological Well-Being and its Relation to Academic
and Prosocial Motivation, Self-Regulation and
Achievement at School

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Psykykinen hyvinvointi ja sen yhteys akateemiseen ja prososiaaliseen motivaatioon, itsesäätelyyn ja saavutuksiin koulussa

Tiivistelmä

Psykykinen hyvinvointi on keskeinen oppimisen edellytys ja kouluympäristön laadulla on sen tukemisessa oleellinen rooli. Tämä tutkimus (N 786, 444 poikaa, 345 tyttöä; keski-ikä 12 v 8 kk) osoittaa, että enemmistö oppilaista voi hyvin. Kuitenkin tavanomaisen kokoisessa luokassa keskimäärin kolmen tai neljän oppilaan hyvinvointi on uhattuna. Se sitoo heidän psyykkistä energiinsa. Tämä tutkimus tarjoaa sekä yhtenäisen teoreettisen näkökulman ajatusten jatkokehittelyä varten että osoittaa, mitä ovat ne keskeiset käsitteet ja niiden väliset yhteydet, joilla oppilaiden hyvinvointia voidaan tukea koulussa. Samalla osoitetaan oppilaiden motivaation taustalla vaikuttavia mekanismeja ja mahdollisuuksia puuttua niihin perustellusti. Tutkimuksen päänäkökymykset pohjautuvat Itsemääräytymisteoriaan. Keskeistä on sen olettamus psyykkisen hyvinvoinnin, motivaation ja itsesäätelyn keskinäisestä vaikutuksesta: mitä paremmin psyykkiset tarpeet autonomia, pätevyys ja liittyminen, tyydyttyvät, sitä autonomisempaa on oppilaan itsesäätely ja sitä sisäisempää motivaatio teorian olettamalla motivaatiojatkumolla. Mitä enemmän oppilas tuntee kuuluvansa yhteisöön, sitä paremmin hän kykenee hyväksymään myös ulkopuolisia (esimerkiksi opetussuunnitelman mukaisia) tavoitteita, mikä on kouluoppimisen oleellinen edellytys. Pätevyyden tunne taas saa hänet tarttumaan uusiin haasteisiin. Oleellista on se, miten oppilas tulkitsee ympäristön palautetta ja tulkintojen perusteella määräytyy toimintaan sitoutumisen (engagement) ja selviytymiskeinojen (coping) laatu.

Poikkileikkaustutkimuksessa käytettiin itsemääräytymisteoriaan perustuvia mittareita, joilla tutkittiin akateemista (SRQ-A) ja prososiaalista itsesäätelyä (SRQ-P) sekä psyykkistä hyvinvointia (BPNS). Oppilaat olivat yleis-, erityis- ja valikoituneen opetuksen oppilaita. Keski-ikä oli 12v 8kk. Tutkimuksessa käytettiin sekä muuttujakeskeistä että persoonakeskeistä lähestymistapaa. Jälkimmäisessä oppilaat ryhmiteltiin heidän hyvinvointinsa, motivaationsa ja kouluosaavutustensa mukaan käyttäen käyttäytymistieteissä melko tuntematonta Itseorganisointuvien kartoitusten menetelmää (SOM). SOM-kartat esittävät monimuuttujaisen datan havainnollisina värikarttoina, jolloin yhdellä kertaa voidaan hahmottaa aineiston olennaisia piirteitä ja yhteyksiä.

Tulokset osoittivat hyvinvoinnin ja motivaation laadun vaihtelevan ryhmien välillä. Klusterointi vahvisti suurelta osin, mutta ei täysin, muuttujakeskeisen tarkastelutavan tulokset. Muodostui kuusi klusteria. Emotionaalis-sopeutumisongelmaiset ja osa-aikaisen erityisopetuksen oppilaat sekä pojat olivat yliedustettuina epäsuotuisimmassa ”motivoitumattomien ja heikosti suoriutuvien” klusterissa. Toisaalta havaittiin, että osa erityisoppilaista oli klusterissa, jossa perustarpeet olivat kunnossa ja kouluosaavutukset keskimääräisiä. Kaikkein suotuisimmassa klusterissa erityisoppilaiden osuus oli vähäinen. Vaikka selektiivisten luokkien (testein valitut luokat) sekä yleisopetuksen oppilaiden osuus sekä hyvin pärjäävissä että parhaiten hyvinvoivissa oli suurin, joka enemmän kuin joka neljännessä heistä havaittiin olevan ”onnettomien suorittajien” klusterissa, jossa koulumenestys oli hyvä, mutta psyykkiset perustarpeet heikosti täyttyvät. Se että enemmistö voi hyvin, ei riitä. Empiiristen tulosten pohjalta havaittiin, kuinka kiinteästi psyykkiset ja motivationaaliset mekanismit ja kouluosuoriutumisen ovat sidoksissa opetuksellisiin ryhmittelyihin. Jo tiettyyn ryhmään joutuminen/pääseminen todennäköisesti määrää osin koulu-uran

suunnan. Tutkimuksen perusteella haluttiinkin kyseenalaistaa varhaiset valikoitumiset ja niiden kriteerit. Motivoitumattomuudelle (amotivation) tunnistettiin vastapari: kehitykseen sidoksissa oleva eriytymätön supermotivaatio, jolloin oppilas on yleisesti motivoitunut, sekä ulkoisemmin että sisäisemmin.

Teoreettisen pohdinnan ja empiiristen tulosten yhteistuloksena syntyi interventiomalli, jonka avulla pyritään siirtämään itsesääteilyä ja motivaatiota sisäisempään suuntaan lähtien oppilaan minäkäsityksen analyysistä yhdistäen toimenpiteet sekä oppilaan sisäisiin tekijöihin että ympäristöön vaikuttamiseen psyykkisten perustarpeiden näkökulmasta.

Avainsanat: psyykkiset perustarpeet, motivaatio, akateeminen ja prososiaalinen itsesääteily, koulusaavutukset

Helena Thuneberg

Is a majority enough? Psychological well-being and its relation to academic and prosocial motivation, self-regulation and achievement at school

Abstract

This cross-sectional study analyzed psychological well-being at school using the Self-Determination theory as a theoretical frame-work. The study explored basic psychological needs fulfillment (BPNS), academic (SRQ-A), prosocial self-regulation (SRQ-P) and motivation, and their relationship with achievement in general, special and selective education (N=786, 444 boys, 345 girls, mean age 12 yrs 8 mths).

Motivation starts behavior which becomes guided by self-regulation. The perceived locus of control (PLOC) affects how self-determined this behavior will be; in other words, to what extent it is autonomously regulated. In order learn and thus to be able to accept external goals, a student has to feel emotionally safe and have sufficient ego-flexibility—all of which builds on satisfied psychological needs. In this study those conditions were explored. In addition to traditional methods Self-organizing maps (SOM), was used in order to cluster the students according to their well-being, self-regulation, motivation and achievement scores.

The main impacts of this research were: a presentation of the theory based alternative of studying psychological well-being at school and usage of both the variable and person-oriented approach. In this Finnish sample the results showed that the majority of students felt well, but the well-being varied by group. Overall about for 11–15% the basic needs were deprived depending on the educational group. Age and educational group were the most effective factors; gender was important in relation to prosocial identified behavior.

Although the person-oriented SOM-approach, was in a large extent confirming what was noticed by using comparison of the variables: the SEN groups had lower levels of basic needs fulfillment and less autonomous self-regulation, interesting deviations of that rule appeared. Some of the SEL- and GEN-group members ended up in the more unfavorable SOM-clusters, and not all SEN-group members belonged to the poorest clusters (although not to the best either). This evidence refines the well-being and self-regulation picture, and may re-direct intervention plans, and turn our focus also on students who might otherwise remain unnoticed. On the other hand, these results imply simultaneously that in special education groups *the average* is not the whole truth.

On the basis of theoretical and empirical considerations an intervention model was suggested. The aim of the model was to shift amotivation or external motivation in a more intrinsic direction. According to the theoretical and empirical evidence this can be achieved first by studying the self-concept a student has, and then trying to affect both inner and environmental factors—including a consideration of the basic psychological needs.

Keywords: academic self-regulation, prosocial self-regulation, basic psychological needs, motivation, achievement

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*Thirty spokes will converge
In the hub of a wheel;
But the use of the cart
Will depend on the part
Of the hub that is void.*

*With a wall all around
A clay bowl is moulded;
But the use of the bowl
Will depend on the part
Of the bowl that is void.*

*Cut out windows and doors
In the house as you build;
But the use of the house
Will depend on the space
In the wall that is void.*

*So advantage is had
From whatever is there;
But usefulness arises
From whatever is not.*

(Tao Te Ching)

It is the relationship that “is” not the things that relate.

Contents

1	Introduction.....	1
1.1	Basic psychological needs.....	4
1.1.1	Fulfilment of basic psychological needs is intertwined.....	6
1.1.2	Autonomy.....	6
1.1.3	Competence.....	8
1.1.4	Relatedness.....	10
1.2	Motivation and Self-Regulation.....	11
1.2.1	Academic self-regulation.....	11
1.2.2	Prosocial self-regulation.....	12
1.2.3	Self-determination continuum.....	13
1.2.4	Emotional reliance and help-seeking behavior.....	15
1.3	Developmental aspects.....	16
1.4	Individual interpretations of contextual factors.....	18
1.5	About Finnish research on well-being at school.....	20
1.6	Summary.....	22
2	Research questions and hypotheses.....	25
2.1	Questions.....	26
2.2	Hypotheses.....	26
3	Methods.....	29
3.1	Design of the study.....	29
3.2	Participants.....	30
3.3	Questionnaires.....	33
3.4	Variables.....	34
3.5	Implementation of the study.....	35
3.6	Analysis of loss.....	36
3.7	Analysis procedures.....	37
4	The basic needs fulfilment study.....	43
4.1	Description of the BPNS.....	43
4.2	Results.....	43

4.2.1	Validity of the measure.....	43
4.2.2	Descriptives of the basic needs and comparison between the independent participant variables.....	44
4.2.3	Basic needs fulfilment profiles of the independent participant variables.....	46
4.2.4	The multi-factorial analysis of variance on basic needs fulfilment.....	48
4.2.5	Basic needs fulfilment and school achievement.....	52
4.2.6	Overall well-being.....	56
4.3	Conclusions of the basic basic psychological needs fulfilment study.....	56
5	The academic self-regulation study.....	67
5.1	Description of the SRQ-A.....	67
5.2	Results.....	68
5.2.1	Validity of the measure.....	68
5.2.2	Descriptives of the academic self-regulation variables and comparison between the independent participant variables.....	69
5.2.3	Academic self-regulation profiles of the independent participant variables.....	71
5.2.4	The multi-factorial analysis of variance on academic self-regulation variables.....	74
5.2.5	Academic self-regulation and school achievement.....	80
5.3	Conclusions of the Academic self-regulation study.....	83
6	The prosocial self-regulation study.....	95
6.1	Description of the SRQ-P.....	95
6.2	Results.....	95
6.2.1	Validity of the measure.....	95
6.2.2	Descriptives of the prosocial self-regulation variables and comparison between the independent participant variables.....	96
6.2.3	Prosocial self-regulation profiles of the independent participant variables.....	98
6.2.4	The multi-factorial analysis of variance on academic self-regulation variables.....	101

6.2.5	Prosocial self-regulation variables and school achievement.....	104
6.3	Conclusions of the Prosocial self-regulation study.....	106
7	Connections between basic psychological needs fulfilment, academic and prosocial self-regulation.....	111
7.1	Self-regulation and psychological well-being in SOM-maps	113
7.1.1	Connections between the variables presented by SOM.....	113
7.1.2	SOM-identified sub-groups.....	117
8	Discussion.....	123
8.1	Main impact of this study, answers to the research questions and implications of the students’ experiences.....	123
8.1.1	Continuum confirmed, and self-regulation and well-being correlate.....	125
8.1.2	Majority are happy and motivated, but still non-autonomous	126
8.1.3	LD and EB overrepresented in the “Amotivated low-achievers”—but luckily not the whole truth.....	126
8.1.4	Special needs almost missing in “Happily succesful”	128
8.1.5	Supermotivation—undifferentiated motivation and self-regulation related to negative RAI	129
8.1.6	The most favorable cluster overrepresented by selective and general education students—but also “Unhappy performers”	130
8.1.7	Pre-determined school careers—in the light of psychological well-being questioning the criteria and necessity of early classifications	131
8.1.8	Girl-power in prosocial behaviors; however, all would benefit of enhanced prosocial identified self-regulation	133
8.1.9	The level of self-regulation and basic psychological needs combined with age	134
8.1.10	The effect of self-regulation and well-being on GPA not uniform, but varies by group.....	135
8.2	Support for basic psychological needs fulfilment and self-regulation: a bigger picture.....	136
8.3	Validity considerations and limitations of this study.....	139
8.4	Theoretical suggestions	141

8.5	Implications for intervention.....	142
8.5.1	An intervention model.....	144
8.6	What the results could mean in educational and special educational practices.....	148
8.7	Future steps for research.....	149
8.8	A majority is not enough.....	150
	References.....	153
Appendix 1	List of figures and tables.....	165
Appendix 2	Decriptives of dependent variables in ed.groups and SOM-clusters.....	170
Appendix 3	Questionnaires.....	171
Appendix 4	More on how SOM-maps are formed.....	174
Appendix 5	Two figures.....	176

1 Introduction

Intrinsically motivated research projects, like this, start out of curiosity. One begins to wonder about a certain phenomenon, continues by questioning, then tries to find answers, and finally wants to give some new explanations for the phenomenon. However, every long-term project also includes tricky phases. Logically even motivation is not stable but can vary during the task from genuine interest to more extrinsic motivation. Especially then both cognitive and emotional self-regulation is needed in order to remain resilient, focused and optimistic.

This psychological well-being and self-regulation study has its roots in everyday school-life. School means usually much joy, enthusiasm, effort and engagement—even though it will be less evident or expressed along with age. That this is true can be easily sensed when entering any school and comparing the feelings one encounters with any other workplace or institution. The majority of students appear optimistic and they seem to believe in themselves. As I am a special education teacher a *majority* was and is, however, not enough. The next picture symbolizes one large piece of the phenomenon this study aimed to uncover: the disinterest, passivity, separateness, loneliness, helplessness some students seem to experience at school from day to day, even from year to year.



Figure 1. Drawing of a girl third-grader with learning difficulties. After being at school over two years, this was her first [that I know] own expression of how she feels about school. In the picture she shows herself on the left as lying on her desk asleep. Her desk is separated from the others, of whom she only has written names, as well as the teacher's. A girl, who has learning difficulties as well, is sleeping under the desk, on the right, only her feet are sticking out.

After a phenomenon of interest (or probably a few phenomena) was identified, aided by reading and thinking it began to have a conceptualized form, to organize in a structured manner, becoming more simple and complicated simultaneously. The complexity emerged when I had to make choices between numerous interesting viewpoints, rule out those that did not fit within the logical continuum. In order to be focused and to progress at all, decisions had to be made, even when they seemed to be reducing the richness of the overall picture. As psychological well-being is such a wide concept it could have been examined by emphasizing many different aspects. I finally decided to emphasize the special educational /psychological viewpoint.

The special educational aspect which is applied here indicates firstly: the involvement of elements of near sciences (e.g. educational and developmental psychology, sociology, somewhat child psychiatry); secondly: a focus on different educational settings; and thirdly: attempts to find key-factors and mechanisms which influence the subject areas of this study in those environments. But the main feature which differentiates the special educational point of view from those of general educational is the core philosophy underlying all the thinking of this study: the holistic starting point of the needs of optimal development and learning which emphasizes emotional security and self-determination of individuals especially in contexts which easily tend to lead to learned helplessness, or underachievement. The distinction between the special educational and psychological domains relies how *pedagogy* is stressed—although psychological constructs and mechanisms are analyzed, the main purpose is to link them to pedagogy, to find some relevance between the results and the educational domain, particularly to special educational theories and practices.

Many studies have analyzed well-being at school—and even more studies have looked at school motivation. What this study tries to bring to this area is:

1. A theoretical, well-grounded framework, which conceptualizes *psychological* well-being, self-regulation and motivation, and shows how these concepts are related. This kind of enterprise seems to be largely missing from current discussions on well-being at school.
2. This is an empirical study, which uses tools based on the mentioned theoretical framework. The study focuses on students with special needs, who according to prior findings are more at risk for psychological ill-being and lower levels of self-determination (cf. Eisenman, 2007). On the other hand placing them in special classes has been justified by the rationale that placing them in small groups, using special methods and special education teachers would enhance not only their

learning, but also their emotional well-being. So the interest is to find out, what happens there—and this is compared to students being in inclusive settings and having part-time special education. Student well-being, self-regulation and motivation are also explored in selective education groups, which provides a rarely used view-point of the other end of the student selection process. The general education sample is used to establish an ‘average’ measure, which is then used to reflect the results for the other groups.

3. In addition to traditional research methods, an innovative, effective visual tool, self-organizing maps, is used to analyze multi-dimensional data.
4. An intervention model is constructed which connects the theoretical and empirical results, and aims to provide an instrument for developing practices to enhance identification of critical points of psychological well-being and support the planning of emotionally beneficial learning environments.

Schools exist because societies need an effective organized way to teach its principles and essential skills to youngsters. A minimum step for achieving this goal is that schools should keep their students within the system and not allow them to drop out. The rest of the steps for an effective schooling system deals with quality, and the optimal education of students. If all these requirements are met the system should support all students to realize their individual potentials, to develop both themselves and society—and to have satisfying lives. Moreover, this should happen despite differences in students’ economic or socio-cultural backgrounds, or gender. This goal becomes more realistic when schools’ plans and practices rely on theoretical and empirical results, and are, in other words, research and evidence-based. In many instances this is even more the case when narrow study perspectives become integrated and the school is observed from a holistic viewpoint. This approach considers schools not only as knowledge transferers but also as enhancers of community feeling, which, in the last resort, as I claim, is the prerequisite for subjective well-being, as well.

It is simple: In order to function fully, to get into a mental state for learning, students have to feel psychologically well. It brings with it motivation, effective self-regulation of behavior, an ability to engagement in tasks, coping strategies for facing obstacles, adjustment to rules and to a group—and these result in good achievement and new effort. Although school is not a miracle maker—it cannot conjure away harmful effects in a child’s past or

heal current family troubles—it can diminish the impact of those effects, compensate, create new possibilities and create trust in self and other people.

The simplicity ends here, and complexity begins. Psychological well-being, self-determination, motivation and self-regulation which surely go hand in hand in education, are connected to self-related beliefs and affect process outcomes: learning, achievement and future aspirations. However, psychological well-being does not guarantee learning, students can report that they are untroubled and experience subjective well-being in classes which they simultaneously rate as boring and unchallenging (Meyer & Turner, 2002). Moreover: revealing those psychological processes underlying observable behavior is hard, though crucially important. Reeve (2002) has noticed that even professional teachers can easily misinterpret the motivational bases that their students rely on. Thus, it is very well grounded to examine what makes up psychological well-being, the dimensions of motivation, self-regulation and degree of self-determination in school, and to use manifold research methods, including self-reports—those were suggested by Reeve, and were implemented here.

1.1 Basic psychological needs

In the empirical study design the main starting point is the idea that psychological health, well-being is dependent on fulfilment of psychological needs, the idea, which has been validated in the Self-Determination Theory (SDT). Deci (2007) makes a distinction between ‘hedonic’ and ‘eudaimonic’ well-being. The former means positive affect and absence of negative affect, more short time feeling happy. The latter, in turn, means much deeper and persisting well-being, meaning in life. Psychological well-being is here understood more in the ‘eudaimonic’ way.

The basic psychological needs satisfaction functions as a mediator of hope; students whose needs fulfilment has been seriously deprived, have been shown to have lost their hope as learners, and to be amotivated. (Deci & Ryan, 2000, Ryan & Deci, 2002). A perspective of hope has been found to be an essential element of academic self-regulation, both in the cognitive and emotional domain (Hautamäki, Arinen & al., 2002), with optimism and enthusiasm being key factors of general well-being (cf. Huitt, 2005). In addition to the needs fulfilment aspect, crucial for this study was the perception of motivation and corresponding self-regulation as a forming a continuum and not just being dichotomously divided into extrinsic/intrinsic. Finally, because well-being was to a large part understood as the result of interaction between

individuals and their environments, the importance of individual interpretation of the school contexts was stressed and considered to be most essential along with the factors influencing this interpretation.

In the majority of studies focused on school motivation, motivation has been seen as a means of achievement, and well-being has merely been comprehended as subordinate, to this purpose. This is also seen in Finnish research into school motivation. In the present study psychological well-being was considered, both as a goal in itself, which is in agreement with the principles of the SDT-theory, and on the other hand, simultaneously, it was considered as an essential factor in motivation and corresponding self-regulation and learning outcomes, because the way or degree the psychological needs become fulfilled indicates what and how big are the emotional costs relative to the achievement outcomes.

The definition and quantification of basic psychological needs is somewhat controversial. The SDT-theory claims that there are three basic needs: autonomy, competence and relatedness. According to the theory the needs are innate, universal, and essential for healthy development. (Deci et al., 2000, 2002). Being innate, an inherent element of an individual's psychological system, is what distinguishes 'needs' from 'motives' (Elliot, McGregor & Thrash, 2002). The concept, as the SDT uses it, is different from Murray's concept of needs, but resembling Nuttin's ideas¹, as Krapp (2005) has pointed out. He has further stated that only these three needs meet the criteria of what is essential for growth.

In one of the alternative studies, in a thorough investigation of ten candidate needs, a fourth need has suggested to be included in the basic needs, namely self-esteem (Sheldon, Elliot, Kim & Kasser 2001). Despite some controversy, the three needs idea was considered more than sufficiently validated for the purposes of the present study—being a theoretical and practical tool for comprehending psychological well-being in school, and organizing empirical findings. Well-being thus means, a feeling of being autonomous, competent and related—when these requirements are met it is believed that hope will follow.

¹ Nuttin (1984) presented the relational perspective to motivation: individual need/environment. This motive as a *relation* between an internal need and an external object is according to Nurmi and Salmela-Aro (2002) the basic assumption of modern motivation psychology.

1.1.1 Fulfilment of basic psychological needs is intertwined

The fulfilment of the basic psychological needs seems to be intertwined in many ways, and to influence each other in a complicated manner. For example, it has been shown that the quality of relatedness need fulfilment in particular personal contact can be predicted according to how the other needs, i.e. competence and autonomy are fulfilled in the same relationship (La Guardia, Ryan, Couchman & Deci, 2000). It is, thus, logically recommended to have a holistic view of needs, and argued that needs cannot be separated from each other and observed separately as we can biological drives (Krapp, 2005). Thus, when studying any one of the needs, one will end up dealing also with the other two, and so in the following, the division into three, should be considered only as emphasizing one dimension at a time. The other two needs will always simultaneously influence the need being examined in the background.

1.1.2 Autonomy

Autonomous behavior regulation has been defined as an experience of choice and a possibility to control one's own actions, to realize intentions, and to prevent undesired events; behavior in which oneself is the source or origin (Ryan & Connell, 1989, Skinner & Edge, 2002). According to the SDT-theory, the opposite of autonomy is 'heteronomy', which means that students are forced to act when they are not willing—a synonym is, thus, not 'independency' and the opposite is not 'dependency'. That is to say that one can accept external requests and values, if they only are in line with one's own genuine acceptance, and acted on not due to be compliant or forced. Being autonomous means action not only based on intrinsic but also integrated values. (Deci et al., 2002). The experience of autonomy develops most favorably in connectedness with others, parents, family and significant others (Harter, 1999). It has been noticed that especially in schools a need for autonomy is related to students' competence experiences (Krapp, 2005).

There exists a large body of results concerning the advantages of supporting autonomy in school. If students encounter friendliness and mutual respect (i.e. the need for relatedness is fulfilled), they more probably feel autonomous, and they are more willing to integrate the school's goals, which means that they more readily accept their role as students and adapt better. This further leads to favorable outcomes: they also get better grades, higher GPA, are more intrinsically motivated, creative, memorize learning contents better—

and have a better self-esteem. (Wiest, Wong & Kreil, 1998; Reeve 2002; Ryan & Deci, 2000; Eccles & Wigfield, 2002). Strict controlling teaching style can enhance discipline during lessons, but the harmful effects have been shown to be more powerful (Barber, 1996). It results either in compliance or defiance, to students' anxiety, lower performance and diminished feeling of competence, less interest in learning, and poorer adjustment to a group. (Deci, Ryan & Williams, 1996; Patrick, Skinner & Connell, 1993; Ryan, La Guardia, Solky-Butzel, Chirkov & Kim, 2005).

External punishments lower autonomy, but so do both material and symbolic rewards as well—with the effect being greater the younger the students are. On the self-determination continuum, the child becomes less self-determined. (Deci & al., 2001; Deci, Koestner & Ryan, 1999; Deci, Eghrari, Patrick & Leone, 1994). Especially in a school environment if long-term goals are preferred over short-term goals, the role of incentives should be carefully considered. Any kinds of incentives are more likely to decrease creativity and deep engagement—than enhance them.

A developmentally inadequate balance of control and autonomy, i.e. excessive control, has also been shown to cause alienation of the true authentic self, this consumes a child's psychic energy from learning, and harms his/her development in school (Ryan et al. 1995). A 'false self' refers to a condition associated with an individual losing 'voice'. A student cannot express his/her true opinions, thoughts and feelings, but tries to hide any experienced feelings of unworthy self or mismatch between self and too high standards. This has not only been observed in some girls' groups (in which femininity becomes emphasized) but also in some boys' groups. (Harter, 1999; Hautamäki, J & Hautamäki, A., 2005). It is dysfunctional and unfavorable for academic and social development. However, one must emphasize an adult's sensitivity to maintain an *adequate balance*, because an overt amount of autonomy that is not age-appropriate, leaves a child without a structure, which according to Ryan et al. (1995) enhances their sense of emotional security.

Especially harmful is a situation, in which acceptance or love becomes a contingent, means of control. The experience of being loved is crucial for a child's mental health. Thus, it is most understandable that acceptance and affection as means of control have been shown to lead to various negative consequences: for example to child feeling depression, guilt, varying self-esteem, anger and engaging in rigid, inflexible behavior (Eccles & al., 2002; Barber 1996; Assor, Roth & Deci, 2004). All these are behaviors that teachers encounter but usually are not able to unravel what causes them.

1.1.3 Competence

The SDT-theory views the need for competence as innate (just like the other two needs). It is based on White's idea of effectance motivation, this claims that people have a basic desire to master their environments. (White, 1959, see Elliot, McGregor & Trash, 2002; Deci, 1975, see Ryan & al., 2005). This need is connected to feeling of capability, self-efficacy and self-worth. It is related to the developing theory of mind: i.e. the ability to see and mentalize self in the eyes of others and others in comparison with self (cf. Elliot & al., 2002). The need becomes not fulfilled by empty praise—it must be truly grounded on real experiences which a student considers valuable. The importance and worth of achievements are mediated to students by their significant others, adults and companions.

The experience of competence causes students to try, to face challenges, feel self-pride, and appreciate others. Students select goals ['a goal' is the object of action, 'a motive' the reason, Deci & al., 1996] and engage in behaviors according to the extent they believe they are able to perform them, and are persistent in their efforts. (Deci & Moller, 2005). It is affected by how valuable one views the goals, and what one aims to gain (task mastery, enjoyment, approval, rewards) relative to costs (energy loss, risk of failure, anxiety, out-selection of other possibilities). Students have to evaluate their ability in relation to task and its level of difficulty (Eccles & al., 2002). According to a study which handled motivational orientations and their consequences in school from the Achievement goal theory point of view, the goals the students set themselves greatly affected the ways they approached tasks and their forms of self-regulation, and those correlated e.g. with self-perceptions, action-control beliefs and learning strategies (Niemi-virta 2004). The motivational theories examine mechanisms, conscious and subconscious factors, which affect the choices.

Theories differentiate between outcome and efficacy expectations. Outcome, success, expectations relate to a belief that certain behaviors will have expected consequences. Efficacy expectations relate to beliefs that one is able to perform those behaviors needed for the outcome. (Bandura, Self-Efficacy theory 1989; see also Eccles & al., 2002). These beliefs develop early during the childhood and influence activity engagement and achievement as an individual ages (Pajares & Schunk, 2001). Future trials have been shown to be more affected by causal attributions, interpretations about achievements—than actual achievements. What is most essential is whom a student thinks has control of the action. (Linnenbrink & Pintrich, 2002; Eccles & al. 2002). This could be described by a concrete example: When one wins a game, more

crucial for the future trials than the actual win is, whether the win is experienced as deserved. According to the SDT-theory (Ryan & al. 2002) if it is experienced only as a whim of chance or an organized win by others, it reduces the winner's self-determination and sense of competence.

According to Weiner et al. (1992) the most important causal attributions are ability, effort, task difficulty and luck. The most common causal explanation in cases of failure is that one did not really try. Doubt of ability is related to shame, and one wants to avoid shame. The reason for success is willingly attributed to an ability. (Covington 1992; see Eccles & al., 2002). The attributions become greatly influenced by the attitude a child has about his/her intelligence: if this is seen as a fixed entity, it leads to dysfunctional attributions and poorer coping than if intelligence is comprehended as flexible and able to develop which encourages approach and effort (cf. Claxton 2000; Dweck 1999).

The attributions can be examined from different viewpoints (how stable, who controls, how controllable)—all which have important emotion (i.e. pride, shame, guilt) related outcomes to the way students perform, and how resilient they remain. How students experience the outcomes depends on their former experiences and on the feedback from their important others, which together further develop the causality attributions, as Weiner explains in his Attribution theory. (Eccles & al., 2002). The way students interpret the causes cumulatively affects their entire time at school, influences self-efficacy beliefs and future outcome expectations (Bandura 1989).

Empirical studies have shown that feelings of competence and motivation in school tend to decrease with age. The competence experiences have also been shown to be domain-specific, not global, overall estimates of one's own capability (Pintrich & Schunk, 1996; Pajares & Schunk, 2001), which implies that when interventions are planned they should be focused on enhancing skills and competencies rather than trying to change global self-esteem.

A recent review of competence and gender issue indicates that firstly the results are mixed, and secondly not much empirical evidence exists. Further it is stated that most studies show either no or minor differences in global academic competence. Some differences appear just when observation happens in specific domains (Hyde & Durik, 2005). Earlier Pintrich and Schunk (1996) summed up the results of gender differences in competence and found that in those studies in which differences have been found they were favorable for boys—although in relation to academic achievement the natural result would have been expected to be the opposite, because of higher performance of girls—and gender has only explained a very small portion of the variance. In the Finnish Learning to Learn study (Hautamäki, Arinen & al., 2002)

similar finding appeared showing that although girls performed better in Math than boys, boys felt more competent in that area. If gender differences appear in competence experience, they probably emerge not in the elementary level but in late middle school (Phillips & Zimmerman 1990, see Pintrich & al., 1996). This is in line with the observation of Harter (1999) who found that self-concept differentiates along with age, and at the end of middle school also gender differences appear in some domains (athletics, appearance, behavior). However, in the domains of the present study—academic and social—Harter did not find significant differences.

1.1.4 Relatedness

Relatedness means connectedness, belonging, having mutual relationships, in which to be accepted and liked. It means sense of being with others, security and unity (Deci & al., 2002), to be part of a group, which shares the same interests, as Krapp puts it (2005). Relatedness needs fulfilment is characterized by warmth of environment, and a deprivation threat (Eccles & al., 2002). Good social relationships have been shown to be significant predictors of motivation (Ryan & al., 2000). The most essential role of relatedness in school is that it contributes to the willingness of students to integrate outside goals, e.g. targets of the curriculum—if control is only provided by a good, warm and friendly manner, avoiding pressuring language (Ryan & al., 2000; Eccles & al., 2002; Reeve, 2002). The good relationships mediate the meaningfulness—it is easier to trust that the extrinsic goals are useful, when persons one accepts control them.

Relatedness experience as well as the attachment style affects the degree of self-determination of a student (LaGuardia & al., 2000; Deci & al., 2000; Ryan & al., 2002). The SDT-theory views each relationship as a new possibility: the quality of the relationship grows out of the extent the basic needs become satisfied in it—and it is not essentially bound to early attachment (LaGuardia & al., 2000; Deci & al., 2000). It is, thus, whenever necessary possible to intervene if one can only identify those children whose relatedness-need is deprived. Children's relatedness situation is in jeopardy for example, if they are not able to approach others, withdraw from social contacts, or annoys others for some reasons. A lack of mental participation might, however, remain unnoticed in systems such as schools, where one is all the time surrounded by others.

Although the fulfilment of the need for relatedness—as well as the secure attachment—is a source of well-being itself, it has been shown also to have

powerful indirect effects², such as: less emotional disturbances and physical symptoms, higher intrinsic motivation, which brings along richer experiences and deeper learning (La Guardia & al., 2000; Goldberg, 2003; Hautamäki, A., 2002). In school, the interaction with teacher is of crucial importance, for example, as the results of the longitudinal Finnish study (Lepola, 2000) examining developmental patterns of motivation indicate. Different goal-orientations have been shown to be related to experience of teacher support. These include avoidance and achievement orientation to diminished support and learning orientation to enhanced support.

There is evidence that relatedness is connected to academic achievement. In addition to the quality of teacher-student relationship, in general students, who have friends and good social skills, are better motivated, as well. They have higher grades and feel more competent than students with behavioral problems, especially aggressive behavior (cf. Juvonen & Wentzel, 1996; Hymel, Comfort, Schonert-Reichl, & McDougall, 1996; Schunk & Pajares, 2005). It has been shown that relatedness with others and prosocial identified motivation are associated. This association forms the basis for understanding and placing oneself in the position of others i.e., empathy. (Ryan & al., 1989; Connell & Wellborn, 1991).

The present study focused, in addition to basic needs fulfilment on two specific domains of self-regulation (and corresponding motivation): academic and prosocial.

1.2 Motivation and Self-Regulation

1.2.1 Academic self-regulation

Self-regulation involves, in addition to cognitive and motivational regulation, an ability to regulate emotional and social behavior (Ryan, Deci & Grolnick, 1995). The developmental source of these behaviors origins in the early child-caregiver attachment, and self-regulation develops gradually in interactions (Goldberg, 2003). A suitable dependency/autonomy balance provided by a sensitive caregiver supports this development. Academic self-regulation

² SDT-theorists stress that fulfilment of the basic needs is a goal in itself. They are strongly against the ideas, which see needs fulfilment as a tool towards other goals. They oppose for example the idea of Bandura, which indicates that the experience of competence would work as a medium for obtaining achievements. According to them the fulfilment of the need for competence outreaches satisfaction, which would be a secondary result of it. (Deci & Ryan 2000, 33). Of course, this does not mean that there cannot be achievement consequences—they are just not the set goals.

means the ability to regulate one's own behavior specifically in relation to learning in school. It is related to metacognition, i.e. to being conscious of those self-regulatory behaviors, which, for example, in the conceptual frame of the Learning-to-learn -project involves, among others, post-failure coping, and tolerance for ambivalences (Hautamäki, Arinen & al., 2002).

Zimmerman (1994) defines academic self-regulation in terms of how active students are in management of their learning metacognitively and behaviorally; this includes time-management skills, effective learning methods, goal-directedness, experience of self-efficacy and willingness to practice. The other side of the mirror, underachievement, is due to giving-up, being over critical of self, more impulsive, less goal-directed and less able to evaluate one's own abilities. Pintrich (see Schunk, 2005) further specifies the goal-directness of effective self-regulation as an ability to have hierarchical goals, and to maintain process and product goals at the same time—i.e. thinking about strategy use and grades, and not just one or the other.

Volition is also connected to self-regulation in that it helps in the integrating of extrinsic goals (Reeve 2002), and it keeps the focused behavior going, after it has been initiated by motivation. It is related to out selection of competing motives, behavior that is essential at school, and is critical especially when a student faces obstacles during a task. (Corno 2004). A logical result is that children with learning difficulties tend to lose the thread, and focus not on the actual task but merely on the situational self-threatening conditions (Vauras, Salonen, Lehtinen & Silve'n, 1993).

1.2.2 Prosocial self-regulation

Prosocial self-regulation has been defined as a socio-moral action, an ability to identify others position, concern for others, voluntary help, cooperate and share. This behavior can be observed either from the perceived control, moral development or empathy aspect (Ryan & al., 1989; Eisenberg 1997; Juvonen & al., 1996) or using a two-dimensional perspective of emotional and behavioral regulation (Pulkkinen, 1995). The motors of prosocial behaviors are not necessarily altruistic. They have been shown to have more or less unselfish or egoistic motives. For egoistic motives Eisenberg (1997) mentions concrete rewards, reciprocity, reducing one's own tension, or getting someone else's approval. Other oriented motives were concern for others, and moral values, i.e. equality or responsibility.

Prosocial behaviors have a relationship with academic self-regulation. It has been shown that those students who are representing higher forms of pro-

social behaviors adjust, cope and succeed better both in elementary and middle school, and vice versa. (Juvonen & al., 1996). They are more popular than the less prosocially active peers (Pakaslahti, Karjalainen & Keltikangas-Järvinen 2002), and it has been suggested that teachers reward prosocial behavior by giving students who exhibit this behavior better grades (Wentzel, 2005). A meta-analysis (Horn et Packard, see Juvonen & al., 1996) showed that socio-emotional factors predicted achievement as well or even better than IQ, neurological or sensory impairments in the elementary level.

Prosocial self-regulation is an important factor in maintaining relationships but also for achievement. Students have to balance between egoistic and more unselfish goals at school. If they emphasize too much performance (grades) it might cost them friendships or popularity and belonging to a group. It is all about the equilibrium between relatedness and competence needs. The balance is important for the performance goals, because as Resource-Control Theory explains, gaining the material resources needed for those goals is partly dependent on the social relationships, as well. This theory makes a distinction between coercive and prosocial strategy. Practicing the former can lead to academic success, but practicing the latter can also lead to popularity. However, having either strategy has been shown to be better than having no strategy at all (Little, Hawley, Henrich & Marsland, 2002). Elliot et al. (2002) explain in a similar manner that the competence experience—if it is other-referential—may cost friendships or belonging to a group. On the other hand: being too much involved in relationships and social life has shown to be harmful for academic motivation and also achievement (Wigfield & Wagner, 2005).

1.2.3 Self-Determination continuum

To be self-determined is to endorse one's actions at the highest level of reflection. When self-determined, people experience a sense of freedom to do what is interesting, personally important, and vitalizing (Deci & Ryan, 2007)

Self-determination was in this study understood as a gradual continuum from less self-determined to more self-determined, according to the SDT-theory (Deci & al., 2000, Ryan & al., 2002). Accordingly motivation and self-regulation was seen as a continuum. This was the case in both the academic and prosocial domains: Ryan and Connell (1989) showed that academic and prosocial motivation and self-regulation had a parallel motivational structure. The perceived locus of control (PLOC) is an essential dimension of the continuum, it reveals, whether the control of behavior is experienced as external

or intrinsic. It determines the motivation style and the style of self-regulation on the continuum³. Note that when, for example, intrinsic motivation is mentioned in this study, it simultaneously implies that the self-regulation is intrinsic, and the locus of control, thus, as well, internal. Although in this study the focus is mainly in self-regulation; one can easily figure out how they correspond with each other by keeping in mind the continuum framework shown in the Figure 2.

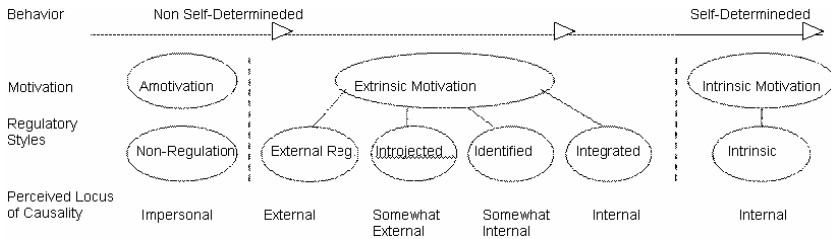


Figure 2. The Self-Determination Continuum by Ryan and Deci (2002).

The continuum diagram (Figure 2) can be logically examined from the left to the right. In the academic school context, the *amotivation*, extreme left, indicates that children are not at all motivated, or motivation is very low. Next comes *external*, which means that children act because they want to avoid punishments or to get incentives. *Introjected* indicates that students behave because of outside or inner pressure. (Ryan & al., 2000). In the light of the prior studies this regulation style might be considered as a shame and anxiety variable (Grolnick & Ryan, 1989; Ryan & al., 1989). *Identified* means that students engage in school activities because school is important for them; they “want to” (Grolnick & al., 1989). This style is said to indicate school satisfaction (Ryan et al. 1989). It can be interpreted to mean success as “being a student”, successful and resilient adaptation to school and its conditions—concepts, which are inseparably linked to “perspective of hope”, which has already been mentioned to be found as a necessity for facing the challenges of school (Hautamäki, Arinen & al., 2002). In the extreme right of the continuum diagram is *intrinsic* motivation, in which the cause of behavior is the activity itself, curiosity, pure enjoyment. The *integrated* is rarely found among schoolchildren; the cause is an integral part of self, although still external. (Ryan & al., 2000, Deci & al., 2000).

³ The term *styles* is argued by the SDT-theorists to be appropriate because *traits* in describing individual differences would be more general and stable in nature, and, *states*, in turn, too easily changing, fluctuating with time and place (SDT-theory homepage 2006).

In the prosocial domain the more internal PLOC is connected to more developed moral thinking (based on Kohlberg: the moral development changes from outside controlled behavior and reasoning towards internalized, autonomous judgment; see section 1.3). The external prosocial regulation represents the less developed socio-moral thinking, which is based on external control by hope of rewards or avoiding punishment, focused on personal gain. Introjected is based on internal or external symbolic pressure, focused on social approval, norms. The most autonomous prosocial self-regulation style is identified and it is related with empathy and moral development, and implies acceptance of the value of the prosocial behaviors. The identified prosocial motivation has been shown to be correlated with self-reported positive relatedness with others. (Connell & Wellborn 1991; Ryan & al., 1989). However, various studies (cf. Gagné, 2003) have shown that also most altruistic behaviors can change into less autonomous ones in the motivational continuum, if people are rewarded for their good deeds

To sum up: The more behavior is self-determined, the less the locus of control is experienced to be outside of self, and accordingly the more motivation and corresponding self-regulation is on the more intrinsic part of continuum. So the theory shows the connections between those motivational and self-regulatory processes and the experienced control. The levels of the self-determination continuum are related to question about degree and acceptance of outside power. It is most essential for integration, whether goals are interpreted as orders or suggestions, and experienced as relevant for self, or most important for the controllers.

1.2.4 Emotional reliance and help-seeking behavior

Especially if a student has special needs, particularly in learning, help-seeking can be hypothesized to be crucial for advancing in studies. Help-seeking is involved with academic self-regulation and motivation (Ruohotie, & Nokelainen, 2002)—and the mentioned acceptance of outside power. Intrinsically motivated students tend to seek help differently (asking when it is appropriate because the task demands it, and more for hints than actual answers) than more extrinsically motivated (who act not because of the task's demands but, because of self, and in order to get ready made answers) (Ryan, Pintrich & Midgley, 2001). This practical help-seeking behavior is connected with emotional processes.

Students whose relatedness need are satisfied, and who are securely attached are more willing to rely on other people and ask for help. This is

called ‘emotional reliance’, which has been shown to be connected with enhanced well-being, and occurs in relationships in which the basic needs fulfillment is supported. The outcome of well-being comprises, according to the results, for example, better self-esteem and lower depression. The less mentally healthy were those, who were apt to “rely on no one”. The researchers point out that this reliance does not mean non-autonomous dependency, excessive reliance, which would be a psychopathological sign, but autonomous, voluntary, turning to others for emotional support. (Ryan & al., 2005). Although emotional reliance was combined with autonomy, it was not explicitly pronounced, what this concept’s role could be in respect of the self-regulation continuum. Especially, it was not thought to relate to identified regulation, which has been shown by Grolnick and al. (1989) to include integration of outside goals, i.e. acceptance of control, because school is important for students, they want to be “good students”.

Help-seeking is experienced most threatening by students who experience low academic or social competence and have low achievement; help-seeking may be avoided because it is comprehended as a signal to their peers that they are not able to undertake some behaviors. Moreover the type of goal orientation has been shown to relate to help-seeking-behaviors: those students who emphasize performance, but get feedback that they have not reached their goals, are more at risk than their mastery-oriented peers. (Ryan & al., 2001). There is evidence that students emphasize connectedness relative to autonomy until they feel they are able to manage by their own, for example, when facing new school tasks (Assor, Kaplan & Roth, 2002). The reason for this could be that this connectedness protects self when facing possible risk for failure and shame a new task might provide.

1.3 Developmental aspects

This study examines events associated with the transition from elementary to middle school, and at the other end from middle school to secondary education. In addition to the big internal changes students face, they have to adjust to environmental changes, as well. The organization of middle schools is different from that of elementary schools (i.e. more teachers, school subjects etc.). The new emphasis placed on grades in the middle school has, in addition, been shown to change motivational orientation towards external. (cf. Eccles & al., 1990; Juvonen & al., 1996). The other critical phase is transition from middle school to high-school (Eisenman, 2007)—that the ninth-graders of this study will face in the end of spring term. Many students have prob-

lems in adjusting to the new circumstances and experience anxiety. These problems are described by the concept of “goodness of fit” between the environment and individual (Jacobs & al., 2002; Eccles & al., 1990; Juvonen & al., 1996)—this, thus, many times means “misfit”.

Students who participated in this study were in late middle childhood, they were 9–11 year of age, and early to middle adolescence, age 12–16 (some older students, as well).

Because of rapid changes during this age-period, it is essential to consider the developmental aspects of self-regulation and motivation, as well. Even motivation and corresponding self-regulation cannot remain unchanged and stable. It has been claimed that intrinsic motivation is rather stable between 9 and 17 year—which is the age-group of the present study—and that it becomes increasingly more with age (Gottfried, Fleming & Gottfried A.W., 2001).

The cognitive development allows more realistic self-evaluations, which in turn affect self-beliefs, competence experience and motivation. At the age of around 11–12 students can make a difference between effort and ability, and from that time their ability-beliefs begin to affect their motivational styles and behavior (Skinner, 1990). From that age the direction is more clearly from motivation and ability-beliefs to achievement, and not vice versa, as in earlier age. (Wigfield & Eccles, 2000, see Aunola 2002). Competence experience becomes more and more equivalent with the grades, tests and teacher evaluations. (Harter, 1999). The self-evaluations have been shown to be related to motivational consequences (Higgins, 1987): if the discrepancy between ideal and actual self is optimal, i.e. not too wide, not too small, it enhances motivation. If it is too wide, it tends to lead to various negative outcomes. If one feels not to be able to meet demands from self or others, the consequences can be worry, guilt, or anxiety; when an individual feels that the desired self is too far, it leads either to depression, sadness or overall dissatisfaction.

It is then a logical result that when children learn more and more to understand the hints and feedback of their performance and efforts, the competence experience and motivation, and especially intrinsic motivation, and corresponding self-regulation tend to decrease. This decrease happens all the way from elementary school to secondary school, to the age of 16 or 17. It has been observed that after that they gradually begin to increase again. Bt Jacobs, Lanza, Osgood, Eccles & Wigfield (2002) in a longitudinal study (grades 1 to 12). Lots of other studies have seen the same tendency, although usually the investigations have not comprised such a large age-range (cf. Pintrich & Schunk, 2002; Eccles & Midgley, 1990; Spinath, B. & Spinath, F.,

2005). A longitudinal Finnish study (Lepola, 2000) which examined developmental patterns of motivation from preschool to sixth grade found a comparable decrease in self-concept from second to sixth grade, which, along with time, became more connected to school achievement. The gender differences in competence experiences were biggest in early elementary years, and the difference diminished with age.

According to Hoffman (2000) empathy forms the basis for moral development, and it is tied to its key elements care and equity. In relation to the prosocial dimension of this study: moral judgment has been shown to develop in line with the thinking stages. The more hedonistic motives of the prosocial behaviors tend to decrease with age, and the motives to become more other-concerned (Eisenberg, Carlo, Murphy & van Court, 1995; Ryan & al., 1989). According to the moral development theory most children of the youngest group, being under 12 years old, are in the pre-conventional stage of moral judgment (cf. Kohlberg, 1984⁴), which means they are still mainly self-centered and others' interests are subordinated to theirs. Ikonen-Varila (2000) has shown that at the end of elementary school around half of the students to be on the way to or in the conventional stage, in which the needs for others are taken into account, and loyalty and social acceptance become important. At the end of comprehensive school 80% of students are in this stage, and a very small minority are about to change to the post-conventional stage, which indicates that those students can consider moral matters in terms of principles, and from a social justice point of view.

1.4 Individual interpretations of contextual factors

When considering the presented factors which only show a narrow glimpse of possible other factors such as the crucial role of early attachment and its relation to later relationships, self-regulation and well-being, and overall parental support⁵, it becomes most understandable that even the same school environment is actually not the same for all the students. They—dependent on their temperament and personal history—interpret the similar contextual factors, e.g. given support or feedback, differently, and those indi-

⁴ There has been much criticism of developmental stage theories, such as Kohlberg (Erikson, Piaget..) in relation to their claims of universality or cultural neutrality, or a hierarchical order, some levels being inferior to another etc. (cf. Schachter, 2005). Despite these (challenging, interesting) criticisms, for example the Kohlberg's moral stages help researchers to understand problems they face when studying school related psychological mechanisms.

⁵ somewhat discussed later in the Discussion in connection with the empirical findings.

vidual interpretations decide, whether an event is experienced as enhancing autonomy, relatedness and competence—psychological well-being—or not.

To make the issue more complex: this process has been found to be reciprocal, it is not only how students interpret the contexts their behavior also affect the environment (Skinner & al., 2002; see also Bronfenbrenner, 1979).

Particularly when students have special needs whether they are learning, emotional and behavioral or others—it is likely that the environment will not always identify the psychological needs adequately. Special problems might call forth overprotection in teachers and caregivers, which lead to the student's low self-determination, helplessness or loss of control (Lachapelle, Wehmeyer, Haelewyck, Courbois, Keith & al., 2005). Previous research indicates that all three psychological needs should be constantly fulfilled, and the autonomy need is more critical (more in jeopardy of deprivation) for children who have emotional and behavioral problems, and the competence need for children with learning difficulties (Deci, Hodges, Pierson & Tomassone, 1992). The aim of the present study was, among others, to find out whether we would confirm these results.

The individual interpretation of social contexts and needs fulfilment influence the way students become interested and direct their own actions and behavior. It affects intrinsic motivation, internalization and emotional integration processes (Ryan 1995). It is associated with a child's academic and social self-concept. It can lead to avoidant or approaching mastery orientation in which the task itself is the main interest point—or to avoidant or approaching performance orientation, in which the ultimate goal is to protect or enhance self (Linnenbrink et al. 2002, Eccles et al. 2002). Basic needs fulfilment predicts engagement in school activities, coping strategies, and the ability to emotional reliance (Ryan & al., 2005), and materializes in different ways. If their needs are fulfilled, the students select appropriate tasks, make initiatives, they are resilient, persistent and focused. If the needs become deprived it has been shown that the students become passive and give up easily. (Connell & al., 1991). In the long run this contributes to the marginalization of students, and dropping out from education.

The whole chain determines how well students develop personally, cognitively and socially (figure 3). (Skinner & al., 2002; Linnenbrink & al., 2002). The consequence of these processes, learning, comes from outside as evaluated by school grades, or standardized tests; consequences in the prosocial domain are given for example by feedback and evaluations significant others provide of behavior.

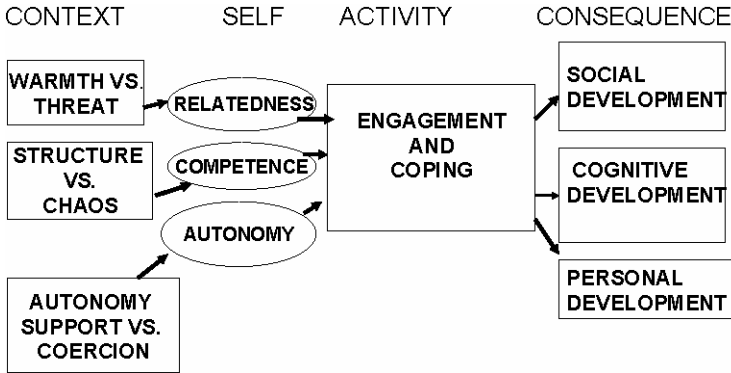


Figure 3. Social contexts and self-determination (Skinner & Edge 2002).

1.5 About Finnish research on well-being at school

There are Finnish studies that have examined well-being at school using different perspectives. The public health study of Konu (2002) (related to the large School health project of STAKES) was based on a sociological model and used the applied depression measure of Beck. In this study well-being was assessed according to the WHO's Quality of Life Assessment (The WHOQOL Group, 1995) in relation to the possibilities of importance young people experience. Those possibilities emerge in areas of 'being', 'belonging' and 'becoming', which are related to self, interaction with the environment and to personal goals. The study showed that school related issues explained one fifth of general subjective well-being; self-actualization and social relationships were most strongly related to general subjective well-being. Socio-economic factors had a small influence on well-being, but family relations, especially conversations with parents were important (more than the family structure or parental control).

The School health survey 2006 of the Helsinki region revealed results related to the well-being of eighth and ninth graders at school. According to it 10% of boys and 13% of girls suffered from school exhaustion; 6% of boys, 3% of girls did not like school at all; 8% of boys and 17% of girls suffered from mid or severe depression. (Luopa, Sinkkonen, Jokela, Puusniekka & Pietikäinen, 2006).

The results of other studies stressed the atmosphere at school, the amount of cooperation, support, and encouragement, the organization and physical environment of school (Savolainen, 2001), the need for support of positive attitudes towards the school, self, and emotional coping (Rask, Åstedt-Kurki,

Tarkka & Laippala, 2002), complex connections with well-being, values, school and family (Joronen, 2005).

Somersalo's research (2002) is rather relevant to the present study (2002), as it viewed the school environment from a child-psychiatric point of view. It was a sub-study of an epidemiological project. The findings indicated that there is an important connection between a child's mental well-being and the school environment. particular risk were found to be boys having internalizing problems and who also were acting them out were found to be at particular risk [internalizing problems=problems in regulating emotions and mood; externalizing=problems in behavior regulation]. In contradiction to prior results, it was found that girls were more vulnerable to factors in their social environment and to class-room disturbances than boys; the question whether this was an indication of a cultural change, remained unanswered.

Maybe the most unexpected result was children's inequality in relation to special needs: class-teachers tended to preferably select girls, a group with higher achievers, and those who engaged more in their studies for remedial education. Also children with better socio-economic backgrounds had enhanced possibilities for receiving remedial education_service. The researcher claimed that the less fortunate children who came were expected to fare worse and this expectation was acceptable to all concerned. In contrast to this result, on the larger scale, the Finnish school system has been shown to be very equitable when compared with other national school systems (Hautamäki, Arinen & al., 2002).

The Learning to Learn Project (6th and 9th graders) included components which are related to well-being, as well, although it was investigating other phenomena Hautamäki, Arinen & al., 2002. The results concerning this aspect showed that students felt contented and competent in many areas of school, and they believed also others respected them and the school. Moreover, there has been a change to an even more positive outlook in six years. A study which focused on sixth-graders, showed that even in those students groups that have the most negative experience about school, the absolute experience is in fact quite positive (mean around 4 in a seven-point Likert scale) (Hautamäki, Kupiainen & al., 2005). The results indicate that school satisfaction should be considered from an absolute point of view rather/or as well than solely from a relative one (which might have been part of the bad reputation) (Scheinin, 2000). This ought to lead to more realistic interpretations.

However some other studies support the reputation of Finnish children not enjoying school (cf. Svedlin & Metsämuuronen, 2000, UNICEF, 2007), which is one surface reflection of psychological well-being, is confirmed. In the UNISEF report of the Finnish (11,13 and 15 year old) PISA-winner stu-

dents only 8% “liked school a lot”. It is interesting that in the overall personal well-being the Finnish students rated themselves as the third best among the 29 nations of the study and they also reported good relationships with peers at school and less bullying than many other nations (UNICEF 2007).

1.6 Summary

The environment in satisfaction of basic psychological needs is believed to lead to psychological well-being, which according to the SDT-theory means a “deep inner sense of wellness, vitality and psychological flexibility” (Ryan & al., 1995). The support of basic psychological needs affects children throughout their school years and it is how they perceive themselves as persons and learners. These self-perceptions form a basis for active or passive engagement in school, and influence the coping strategies children adapt. Those styles and strategies result, for example, in identification and integration with the values and curriculum targets school authorities have planned; they most likely lead to good school performance, other-concerned prosocial behavior—or vice versa to maladjustment, under-achievement and other-indifferent, egoistic behaviors. The next figures (4 & 5) sketch the conceptual field, which form the basis of this study.

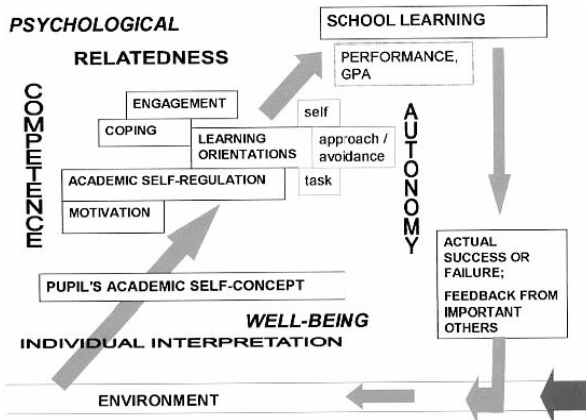


Figure 4. Academic Self-Regulation and the suggested conceptual field around it.

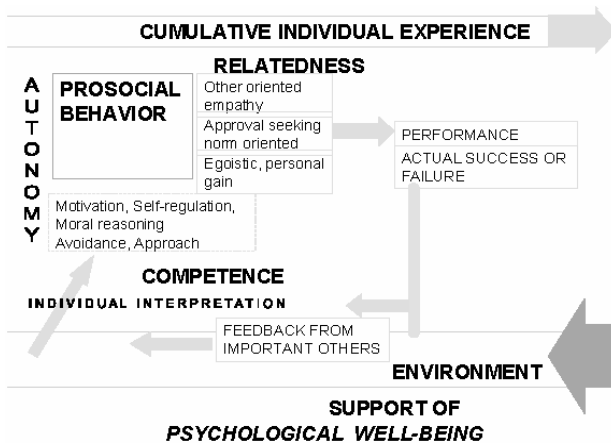


Figure 5. Prosocial Self-Regulation and the suggested conceptual field around it.

2 Research Questions and Hypotheses

The overall purpose of this study was to find out how students experience their learning and psychological learning environment, and to explore mechanisms relating to mental health. Several studies have shown that fulfilment of the basic needs is in jeopardy, especially if a student has learning or other problems (Deci & al. 1992). Environments that do not respond to the students' needs, can lead students to that state known as 'learned helplessness' (cf. Sutherland & Singh, 2004), to drop out⁶ of schooling (Jahnukainen, 2007) and in the extreme to criminal behavior and suicidal behavior (Sinkkonen, 2007). On the other hand students with special needs have shown to have a relatively positive view of their learning environment, special class. They mention to be able to concentrate, and to learn better and have more interest in school—although they also tell that they are frequently being bullied (Kivirauma & Rinne 2004). To find out more students with diverse special needs were invited to participate in this study.

According to the SDT, psychological well-being is not dependent on the achievement level of the child. For this reason, even a high capability in one area, or overall giftedness does not, of itself, guarantee a person's sense of well-being (cf. Dweck 1999; Hotulainen 2003). Not every high achieving or gifted child automatically feels autonomous, related or competent. Other sources claim against this by arguing, for example, that school grades enhance competence beliefs in high-achievers (Spinath &, al. 2005). To find out how various environments affect students' school experiences and feelings, the study focused not only on students from special education classes, but also on students from highly selective classes. In the following, the research questions are presented; the first two questions are related to basic psychological needs (=psychological well-being), questions three and four to academic self-regulation, questions five and six to prosocial self-regulation, and the seventh and eighth questions bring those three together.

⁶ Although the total drop-out of the comprehensive school was very rare at the time the empirical data was collected (only less than 10 students out of total 23000, in the city concerned), it is a serious problem in a society.

2.1 Questions

The research questions were:

Basic psychological needs satisfaction at school

1. How does the fulfilment of basic psychological needs vary with gender, age, educational group and city at school?
2. How is the fulfilment of the psychological needs related to school achievement?

Academic self-regulation at school

3. How does the academic self-regulation and motivation vary with gender, age and educational group at school?
4. How is the academic self-regulation and motivation related to school achievement?

Prosocial self-regulation at school

5. How does the prosocial self-regulation and motivation vary with gender, age and educational group at school?
6. How is the prosocial self-regulation and motivation related to school achievement?

Combined basic psychological needs fulfilment, academic and prosocial self-regulation

7. How are basic psychological needs fulfilment, academic and prosocial variables related to each other?
8. What kind of self-regulation/psychological well-being/achievement sub-groups can be identified on the basis of this study?

2.2 Hypotheses

In the introduction several connections of the research variables were discussed on the basis of the prior results. They have shown that basic psychological needs fulfilment is intertwined and correlates with self-regulation styles. Intrinsic style has been shown especially to be connected to autonomy and competence; both academic and prosocial identified self-regulation to relatedness. However, autonomy is related to identified self-regulation, as well.

Prior results indicate that both needs and self-regulation styles correlate with school achievement. The more the basic psychological needs are fulfilled, the higher the school achievement. Intrinsic style has been connected to better performance, external to lower ones. The connection is stronger in elementary than in middle school.

The basic psychological needs fulfilment experiences and self-regulation styles are developmentally bound, at least in some extent. Competence experience and intrinsic self-regulation have been shown to decrease with age. If there is a difference between boys and girls in fulfilment for competence, it tends to level off with age. The overall level of self-regulation has been shown to diminish with age. Deprivation of basic psychological needs and more external self-regulation styles are related to learning and emotional-behavioral difficulties.

On the basis of the literature and those prior results, the following working hypotheses were formed (they are to be realized more like helping to structure the study and presenting the results—than strictly taken statistical hypotheses):

The basic psychological needs fulfilment

- H 1: The fulfilment of different basic needs is intertwined.
- H 2: The basic needs fulfilment does not vary by gender (but if there is a difference, it tends to level off with age).
- H 3: Fulfilment of psychological needs is more threatened in special education.
- H 4: Criticality of the different psychological needs fulfilment varies between different special education groups (autonomy is more likely to be in jeopardy in the groups with emotional and behavioral needs, competence in the groups with learning difficulties).
- H 5: The basic needs fulfilment experiences do vary with age; transition from elementary to middle school is an essential factor.
- H 6: Basic psychological needs fulfilment is connected to school achievement.

Academic self-regulation

- H 7: The academic self-regulation and is structured as a continuum
- H 8: The academic self-regulatory styles do not vary with gender.
- H 9: The overall level of self-regulation has been shown to diminish with age; the transition from elementary to middle school is an essential factor.

- H 10: The self-regulation styles vary with educational group; students with learning difficulties are less autonomous than students without learning difficulties.
- H 11: Academic self-regulation has a correlation with school achievement: especially intrinsic self-regulation will be correlated positively with school achievement, and external self-regulation negatively.

Prosocial self-regulation

- H 12: The prosocial self-regulation is structured as a continuum.
- H 13: The prosocial self-regulatory styles do not vary with gender.
- H 14: The prosocial self-regulatory do vary with age; the transition from elementary to middle school is an essential factor.
- H 15: The prosocial self-regulatory styles vary with educational group; especially students with emotional and behavioral needs have a less identified style than students without emotional and behavioral needs.
- H 16: There is an association between prosocial self-regulation and school achievement.

The relationship of the basic psychological needs fulfilment, academic and prosocial self-regulation

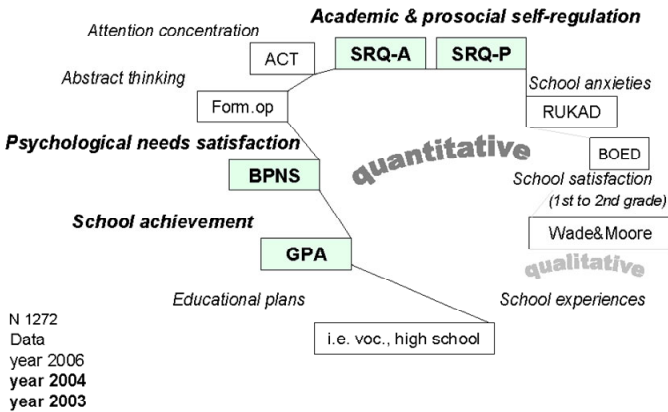
- H 17: Basic needs fulfilment is connected to academic self-regulation.
- H 18: Relatedness need fulfilment is connected to the prosocial identified self-regulation.

In addition, the following merely indirect connections were discussed in relevant contexts. Although in this study the motivational, goal orientations were not measured, it seemed justified to draw theoretical conclusions from them – and, thus, realize the common touching points the SDT-theory has with the Achievement Goal theory (cf. Niemivirta, 2004) because it is widely confirmed that external self-regulation is connected with avoidance, introjected with performance, intrinsic with mastery goal orientation (Yamauchi & Tanaka, 1998). Further the self-regulation styles and basic psychological needs fulfilment have been shown to correlate with coping strategies: Identified self-regulation style to accommodation, intrinsic to negotiation and effort, introjected to perseveration, external to opposition (Skinner & al., 2002), and to denial and to projection. Finally, basic needs satisfaction is claimed to be a mediator of hope (Deci & al. 2000; Ryan & al., 2002).

3 Methods

3.1 Design of the study

This doctoral thesis is a sub-study of a larger project. The larger project consists of several sub-studies which explore in addition to self-regulatory behavior, psychological well-being of students in elementary and middle school, school anxieties and experiences of participation, interaction with other students and teachers, and school-tasks in relation to school achievement, attention concentration and formal thinking. In addition to questionnaires, the whole project includes qualitative items in the form of sentence completion tasks. The empirical data were collected in the spring of 2003, 2004 and 2006. In order to illuminate the larger context of the present dissertation study, the whole project design is presented first in the Figure 6 below (the samples and measures of the dissertation study are shown in bold text and shading).



The present study: N=789, participants from general, special and selective education

Figure 6. The whole project design (the thesis study is indicated by shaded boxes and bold text).

3.2 Participants

The students who participated year were both from elementary and middle schools, from grades 3 to 9, the mean age was 12 years 8 months (min 9, max 18), N=786. The selective education students were in average younger (12 years) than students in special and general education (13 years), this must be borne in mind when the results are interpreted. (In the profile analyses that effect was controlled by using age as a covariate).

The sampling method was a kind of judgment sample, it could be called 'a non-proportional quota sample' (Trochim, 2005), because the aim was to include as many special education groups as possible. All sixth and ninth grade special education classes of the capital area city (200 000 inhabitants) participated; in addition 5th, 7th (in order to get participants of both sides of the critical transition from elementary to middle school), and 8th grade classes which were selected from three schools having plus general, also special needs and selective classes. In order to have a reflection surface, a sample of 146 students was included from a small town (53 000 inhabitants) in eastern Finland.

There were three main educational groups in this study:

1. general education ("GEN") (part-time special education, i.e. mild learning difficulties, separated from it),
2. special needs education ("SEN"), and
3. selective education ("SEL").

Special needs education was organized in segregated classes in general schools, or, in a smaller extent, in segregated schools. The maximum class size of special classes is ten students. In the school-year 2002–2003 (the present empirical study results are from the spring of 2003 and partly 2004) there were in the city the main sample is from, 23000 students in the comprehensive school. From those 4100 (18%) got part-time special education (explained later in this section); 10% of those were integrated which means that they had an official special education decision. 1160 students (5% of all comprehensive school students) were in special education classes at that time. (SUKO, 2004).

The following figure 7 describes special educational support process at school when a student has learning, emotional and behavioral needs or others in that city the present study was conducted. It starts from the bottom in general education setting in which a problem is identified. The process goes forward step by step by from so called supportive tutoring given by the class- or

subjective teacher toward more and more professional special educational practices. In general: if all the other measures have been used the student will get an official special education decision (through thorough evaluation of the school psychologist and school well-fare group, at least in the city this present study was administered) and either be integrated in his/her ordinary class or to be transferred to a special class. If a child gets an official special education decision an individual learning plan (ILP=HOJKS) has to be made. Those children having that decision can study according to the general curriculum or follow an individually adjusted curriculum. It is also possible that a child starts school in special class because his/her learning or other problems have been identified already before school starts. The purpose is that this system is flexible and the individual needs of the child are considered. This means that the special education decisions can be changed and it is possible to return the process steps backwards, as well. All the way cooperation with the parents is essential.

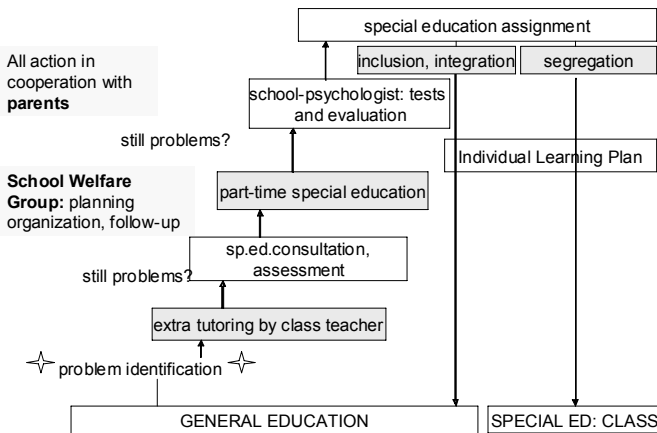


Figure 7. The special-educational support process at school

The participants were from the following groups :

Group Emotional and behavioral needs (“EB”). Students in this type of education have many times more or less extensive difficulties in social interaction, emotional, behavioral and adjustment problems, acting out –type, aggressive behavior. Many have attention difficulties, and many times the difficulties relate to social background problems. These students are much more often boys than girls. They have an official special education decision. Their

education follows general curriculum and the organization of the education is administered in special classes. [This group is the most rapidly growing according to the statistics from the school year 2005–2006; Tilastokeskus, 2007).

Group Learning or other problems, neurological origin (“NO”). Students in this class type have various learning problems which relate to neuro-cognitive disorders, sensory-motor and motor problems. They many times have delayed language development and problems in basic skills, reading, writing, math and foreign language. They also can have problems in interaction with others. They have an official special education decision. Their education follows general curriculum and teaching happens in special classes.

Group Developmental delay, lower academic standards (“LA”). This group has adjusted curriculum. They usually have problems following the general curriculum in several academic school subjects, and that’s why they have individualized learning plans and accordingly adjusted learning materials and books. They have an official special education decision. The education happens in segregated classes and in some instances in special schools.

Group Part-time special education group, which included pupils with mild learning difficulties and integrated students (“LD”). These children go to school mainly in the general class, but get once or twice a week special education support. This happens most of the times in small groups, sometimes individually and sometimes so that the special education teacher comes to the class and supports the child’s learning there. Some of these students have an official special education decision, but many of them don’t. Some of them are having this part-time support throughout their school, some just temporarily. The difficulties vary, but dyslexia or milder reading and writing difficulties are common, problems in math and foreign language, as well. Typically these children also have problems in self-regulation and attention. The problems are very much like the NO-groups, but usually milder and often no neurological reason has been identified as the reason.

Selective education consisted of:

Group Music classes (“MUS”). They have been tested on their musical ability in the end of the second grade and started in music class in the third grade. It is also possible that some of them enter the music class after elementary school and the test is then in the end of the sixth grade. In the music class some school subjects might have less lesson hours, because practicing music and various performances consumes time. Many times in these classes girls are the majority.

Group English classes (“ENG”). The children are tested before the first grade. The test criteria are a good command of the English language and general verbal ability. Sometimes the children are tested later. This happens if they have been abroad. Most of these children are Finnish but they have been living abroad.

Group Science-Mathematics class (“SCIMA”). The children in this class are being tested on their knowledge in Biology, Geography and Math; the majority are boys. In this sample only a small group of this type of education participated and thus the SCIMA-results cannot be generalized and have, thus, only curiosity interest.

Because of the overemphasis of special education in this sample, boys were the majority with 56% (boys n=444, girls n=345).

All the results were compared by the independent participant variables: gender, age and educational group. The educational groups and age were observed at different levels (Table 1).

Table 1. Educational groups by different observation levels.

First level	1. general 310		2. special* 287			3.selected 192		
Second level	1. GEN	2. LD	3. EB	4. NO	5. LA	6. MUS	7. ENG	8. SCIMA
Total N 789	327	64	68	72	66	48	128	16

* incl. Finnish as a second language students

Age was also observed at different levels (Table 2).

Table 2. Age groups by different observation levels.

First level N 789	1. elementary school 571	2. middle school 357
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3.3 Questionnaires

This study presents the results of three sub-studies of the self-regulation project. The questionnaire apparatus consisted of Academic Self-Regulation (SRQ-A) and Prosocial Self-Regulation questionnaires (SRQ-P) and Basic

Psychological Needs Satisfaction at School (BPNS) questionnaire which all are based on the Self-Determination Theory (SDT) of Ryan and Deci (2002)⁷.

The study obtained students' views about several school related areas ranging from reasons for working hard during lessons to trying to help others. In addition to aspects of self-regulation, the questions in these scales were targeted to find out, for example, how children's environments manage to fulfill the three basic needs: competence, relatedness and autonomy.

3.4 Variables

Variables of the sum were formed according to the SDT and the related: BPNS (basic psychological needs satisfaction at school) questionnaires: SRQ-A (academic self-regulation) and SRQ-P (prosocial self-regulation). The psychometric properties of the Finnish versions are presented in Table 3.

Reliability estimates of the scales were mostly satisfactory (Cronbach values of over .70). However, the variables 'Autonomy', and 'Competence' from the BPNS showed lower scores. Consequently, interpretation of the results using these variables should be made carefully.

The indicator of school achievement was the great point average (GPA), which was obtained from 743 students. GPA differed by educational group [$F(2,742) 165.74, p<.001, \eta^2=.30$]: in general ($M=8.03, SD=.76$), special ($M=7.05, SD=.82$) and selective education ($M=8.22, SD=.92$); all groups differing significantly from others.

Table 3. Descriptives and reliabilities of the variables of the study.

	N	Items N	Min	Max	M	SD	Alpha
SRQ-A							
External (exte)	785	9	1.00	4.00	2.57	.60	.79
Introjected (intro)	785	9	1.00	4.00	2.51	.62	.84
Identified (ident)	785	7	1.00	4.00	3.04	.58	.82
Intrinsic (intri)	785	7	1.00	4.00	2.26	.67	.85
Rel.auton.index (RAI)	771		-5.56	6.00	-.57	1.56	
SRQ-P							
External (extb)	784	5	1.00	4.00	2.58	.64	.71
Introjected (intob)	784	10	1.00	4.00	2.95	.58	.85

⁷ More detailed information about the questionnaires is provided later in relation to each sub-study and in the Appendix 3.

	N	Items N	Min	Max	M	SD	Alpha
Identified (ideb)	784	10	1.00	4.00	3.38	.56	.90
BPNS							
Autonomy (auto)	788	6	1.00	7.00	4.68	.96	.60
Competence (comp)	788	6	1.67	7.00	4.92	.90	.58
Relatedness (rela)	788	8	1.50	7.00	5.04	.97	.77
ACHIEVEMENT							
GPA	743	6-11	4.50	9.83	7.70	.92	

When the distributions of the BPNS, SRQ-A and SRQ-P variables were observed and tested for kurtosis and skewness, they were overall found to be normally distributed. The exception was the identified variable of SRQ-P which was both positively skewed and high peaked: the skewness score was significantly higher than the criterion value of (two times standard error) .17 (1.28) and the kurtosis score deviated very significantly from .35 (1.94). The raw scores of this variable were kept intact in the analyses, however, because of theoretical reasons: the self-regulation continuum was seen as important and dropping any of the variables would have violated the continuum. The results of this variable have to be interpreted remembering this source of bias.

3.5 Implementation of the study

As a researcher I went to every school (25) and class (40) myself, and in most cases gave the instructions. In some instances the study was conducted simultaneously in several classes, and then I circulated from one classroom to another and cooperated with a special education teacher, with whom the necessary information was shared. In most cases I stayed in the classroom for the whole time, which varied from the middle school's 40 minutes (the shortest) to elementary school's 1 ½ hours (some special education classes) (average 45–50 minutes). In some cases there was either a class-teacher or subject-teacher present, but in a passive role. In a few special-classes, where a reading aid was needed, both teacher and school assistants were instructed to help out, but not to influence the way their students' answered the questions.

After a short "getting to know each other", an ice-breaker conversation, the students were given instructions. They were assured strict confidentiality. They were further told that all the answers were right, it was not a question of a test, and that they were asked because they were the professionals in school-related matters—and could help in developing schools to become

pleasant working-places. They were encouraged not to try to please anybody but to give genuine opinions. If they could not think an answer, they were encouraged to answer what would be nearest in their mind, and in a cases were they really could not find an answer to leave the question unanswered (there was no “I don’t know”-alternative). Before they returned the papers, they were advised to check that there were no questions left accidentally unanswered.

3.6 Analysis of loss

The analysis of external loss showed that 8% out of 789 students 63 were absent and 5 did not receive permission from their parents to participate in the study day; from general education 6%, special education 13% and selective education 4%. However, those group percents should not be compared because in one of the schools those students who were absent on the actual study day had the possibility to do it when they returned, and were not counted as absent. In that school there were general and selected classes but no special education classes. When that school was omitted, the percentages were general education 8%, special education 13%, selective education 6%—so the order was the same, but the differences levelled off a little. Further examination revealed that the high special education percentage was dependent mainly on six classes. In two of them half of the students were missing and in the four others the number was a little less. In the rest of the 25 special classes either zero or one student was absent.

The analysis of internal loss of *BPNS*, *SRQ-A* and *SRQ-P* showed that in total less than 1% of scores were missing.

The missing scores could have been compensated by the group means, but instead it was considered more reliable to use the listwise procedure for those few missing scores recommended by Allison (2002), and to calculate the means using only the available scores.

3.7 Analysis procedures

Table 4. Hypotheses and analysis procedures.

Hypothesis	Analysis procedure
1, 8,14 H: Basic needs fulfilment intertwined, self-regulation variables structured as a continuum	Pearson's correlations, paired samples t-test
2-6, 9-12, 15-18 H: a) Differences between the basic needs fulfilment and self-regulation variables by the independent participant variables b) The relative role of the test variables in the basic needs set and the self-regulation sets c) Relative importance of independent participant variables and interaction effects on basic needs fulfilment and self-regulation	a) One way analysis of variance (and Tukey post-hocs) b) Profile analysis (MANCOVA) c) Factorial analysis of variance (and Bonferroni corrected pairwise comparisons of estimated means).
7,13,19 H: Basic needs fulfilment and self-regulation styles have an association with school achievement	Partial correlations, Linear regression analysis
20-21 H: Basic needs fulfilment and self-regulation styles are connected to each other; it is possible to identify groups with diverse psychological well-being and self-regulation combinations	Self-organizing maps analysis; cross-tabulation (Chi sq).

The following justifications were put forward for using the multivariate methods:

- 1) The self-regulation and basic psychological needs fulfilment variables of sum were normally distributed (with the mentioned identified of SRQ-P being an exception) so it was justified to use parametric tests.
- 2) The prerequisite for performing the profile analysis (MANCOVA) is that Boxes M statistic is satisfactory ($p > .05$). However, the Box's M test is said to be unnecessary if the variances of groups are quite equal and the sample sizes do not deviate much. Thus, the profiles have been tested even if the strict Box's M rule has been somewhat violated. (cf. Nichols, 1995, Nummenmaa & al., 1997, Metsämuuronen, 2003).
- 3) The prerequisite of using the GLM Univariate test, the homogeneity of variance, was mostly met in all analyses, because the Levene's test showed a significance level over .05 (Munro, 2001).
- 4) For all linear regression analysis the VIF- values were examined and they remained clearly under the critical value of ten, and the tolerance

values were satisfactory, too, being nearer one than zero, which indicated that multicollinearity would not make the model unstable.

In order to examine the reliability of the regression analyses⁸, the datum was cross-validated in BPNS, SRQ-A and SRQ-P by splitting the sample into two (by coding every other observation as 1, and every other as 2), conducting separate regression analyses and comparing the results. The residual diagnostics was conducted for the regression models assuring that the residuals were normally distributed.

The first aim was to explore *the structure and qualities of the data*, and observe whether the suggested three basic needs fulfilment and the self-regulation continuum structure would be validated in this sample. This was done by studying the correlation coefficients.

The next aim was to answer the first research question for every sub-study, which required *description of the data* first in general and then by specific background groups. The description involved exploring the means, standard deviations, minimum and maximum values of every test variable.

The one way analysis of variance was used for significance testing⁹, and post hoc (Tukey) comparisons in specification of the differences. The significance level was chosen at $p < .05$ level, which means that a 5% risk making an erroneous decision in rejecting the null-hypothesis was taken. The paired samples t-test was used in order to compare the means of the basic needs fulfilment variables with each other and also the self-regulation variables with each other. The next aim was to *compare the relative effects of the different independent participant groups* and test, but *the main*, also *interaction effects*. The method was GLM Univariate multi-factorial analysis of variance, also called multi-way analysis of variance, and using Bonferroni corrected pair-wise comparisons of estimated means. The advantage of this method is that it allows use of multiple factors in the same analysis. This is said to reduce error variance and increase power. (cf. Cramer 2003, Munro 2001). The possibility to study the interaction effects, too, was considered important on the basis of prior research, reviewed in the introduction: age or gender could have different role in relation to basic needs fulfilment and style of self-regulation in general and special and selective education.

The multi-factorial analysis of variance tests were conducted on the basis of the research hypotheses by regressing the independent participant variables

⁸ Concerning the validity: Replication is considered to be best, but when it is not possible cross-validation is suggested (cf. Hellberg 2006).

⁹ The method was mainly chosen because then the results could be somewhat compared with the results of some earlier studies using the same method. On the other hand, by using different methods one is better able to judge the relative importance of one's results.

on basic needs, and academic and prosocial self-regulation variables, one in turn. The tested models on each basic need fulfilment and self-regulation variable were:

1. Gender (2) x educational group (3) x age (continuous)
2. Gender (2) x educational group (8) x age (continuous)
3. Gender (2) x educational group (3) x elementary/middle school (2)

The default alternative, sum of squares III type, was used as the method in the GLM; in it each individual effect is adjusted for all the other effects. This provides the unique effects of every variable, which is not shared with the others. Cramer recommends this type for non-experimental studies, in which one is interested in the unique effects of each variable, as the case is in this present study (earlier Tabhanick & Fidell, 1996 had recommended it for experimental research studies)(Cramer 2003). The custom mode alternative was used because it allows us to choose the wanted main effects and hypothesized interaction effects (all the two-way ones were chosen) alternatives by hand. The interaction effects were in some cases observed also graphically by plotting separate lines for each group concerned, and in case of the continuous ones also by the SPSS Graph, Scatter/ dot mode and requiring the regression lines and Rsq:s for each group. Only the significant factors were entered in the final models, and conclusions drawn accordingly, this is recommended (cf. Nummenmaa, 1997). The effect sizes were calculated by dividing the sum of squares factor by sum of squares total which is the classical η^2 . The partial η^2 that is directly provided by SPSS has many times been found to be misleading and showing too high effect sizes (Pierce, Block & Aguinis, 2004).

The specific Multiple regression analysis alternative was used, in addition, because it makes it possible to enter non-categorized variables (basic needs fulfilment, self-regulation variables, age) in the model. The regression analysis was used as a method for identifying the independent participant variables, basic psychological needs fulfilment and self-regulation variables, which are the most effective *predictors of school achievement*, GPA was used as an indicator. As already explained in the introduction section, there is confusion about the direction of the effect, and although here the dependent variables are many times referred to as *predictors*, actually the aim is not to claim that fulfilment of basic needs (or self-regulation variables) causes high achievement—the situation might, as well, be the other way round.

When the relations between the other variables and school achievement was analyzed, the first possible interaction effects were searched for by GLM

Univariate (if found, the analysis continued in split groups). When Multiple regression analysis was used, school achievement, GPA, was set as an independent variable and on it basic needs fulfilment or self-regulation variables, then SEN/SEL and finally age and gender. In the second model instead of SEN/SEL dummy variables were used (LD/all others, EB/all others, NO/all others, LA/all others, ENG/all others, MUS/all others, SCIMA/all others). In the third model, continuous age was replaced by dichotomous elementary/middle school, because we were interested in uncovering the effect of the transition from elementary to middle level school. To illuminate the connection of achievement and basic psychological needs fulfilment (or self-regulation).

However, testing the separate variables for main and interaction effects was not clarifying *the relative roles of the basic needs set or self-regulation set*, and, thus, multivariate analysis of variance (MANCOVA) was used (age as a covariate). Because the main tool was graphic comparison of the profiles that the tested variables formed in different groups, the method is here referred to as Profile analysis. The GLM Repeated measures procedure was used for this purpose (cf. Nummenmaa & al., 1997, Weinfurt, 1995). The effective use of this method requires that the dependent variables correlate, ideally both theoretically and empirically, this is true for the three sets of the present study.

The basic needs fulfilment and self-regulation variables were first standardized in order to keep the group differences, but to flatten any overemphasis of any of the variables. In the analysis procedure basic needs fulfilment variables and self-regulation variables were chosen, as a set, in turn, as the dependent variables; gender, elementary/middle school, and GEN/SEN/SEL education as a fixed factors (age was used as a covariate in alternative models in order to control its effect).

The profiles were tested for parallelism by Wilks' Lambda. If the profiles were non-parallel, it was not necessary to test the level or flatness, because they would then also deviate. If the profiles were non-parallel, it is recommended that further analysis of profiles should be done by graphic observation, and this was then done. If the profiles, however, were parallel, also the flatness was tested by studying the main effects of the basic needs variables or self-regulation variables and the level, coincidence of the profiles through the main effects of the independent background groups. To sum up: The profiles were graphically and statistically compared for level, form and the degree of evenness. Graphic observation was done both by controlling for age and without controlling for age.

The profile analysis as a methodological choice was considered as justified also on the basis of Harter (1999), who sees it as a valuable way to understand specific subgroups. As examples she refers to gender profiles and, among others, profiles of groups with learning difficulties and profiles of gifted children.

In order to show the data dimensions simultaneously in a concrete way, and on the other hand to be able to group students according to similarities in self-regulation, basic needs fulfilment, and achievement the data-mining method, Self-organizing maps (SOM) was used. Because the method is unconventional in psycho-educational field, it needs some explanation (see Appendix 4 for more technical details).

The added value of using SOM compared to traditional methods is its unique way to project the highly multi-dimensional data into two-dimensional maps. Self-organizing maps takes all input data into account (different scales are no problem: data become first normalized) but one is able to decide that some of the variables are masked and do not take part in the iteration and training of the data. Each map presents one variable. The data variance and the variable connections become visualized and presented by colors and placement of the nodes (=grid-points). One can identify correlations between the variables by comparing the colors: if the same colors are in the maps in the same place, positive correlation exists; if the colors are opposites, this indicates negative correlation; if spread randomly, no correlation is to be found. The tone or the intensity of the color varies according to the means on the scale (the scale is shown under each map).

SOM-clustering resembles the K-means method. However, the SOM view is richer because SOM show the clusters relative to each other, they thus take the neighborhood into account. In the K-means each node is to be perceived as a cluster, in that sense it is similar to SOM. In both methods the best matching unit changes most towards to the input vector. The difference is that in SOM also the neighborhood nodes change which does not happen in K-means clustering. In other words the more near situated clusters share more common information than the more distant clusters¹⁰. The K-means method simply lists the different clusters but one cannot spot the relative relationships between the clusters and the observations. (Kohonen 2006; Kaski 1997; Oja & Mannila, 2005). (Oja & al., 2005). These differences to K-means, it is possible to observe neighborhood and continuity¹¹ the matters in SOM can be at more specific or general levels. In other words as one node is

¹⁰ However, although in the SOM-maps the characteristics of the nodes change very much continuously, it is not fully so, but there are some “jumps” in between (Oja & al., 2005).

¹¹ The cluster amount can be chosen and experimented in at least some SOM-software

the original cluster, that node and its similar neighborhood can be comprehended as a rougher, general cluster (=thus a combination of the original clusters). The more general the level is, the rougher the picture becomes, and the more differences there are to be seen between the observations.

The SOM reveals whether there are any patterns in the data. It shows the cluster-borders, so it is possible to choose a particular cluster, and study the cluster contents. The observations (students) can be spotted in every map in the same place, so one can easily compare what the relationship to each variable is—it is even possible to identify individual students of the clusters. One can observe the statistical descriptives and analyze the data information for each cluster. In addition the cluster data can be transferred to SPSS, or other traditional statistical methods. (cf. Thuneberg & Hotulainen, 2006).

The fact that SOM seem to offer a more comprehensive picture of the data and the relationships of the variables than more traditional methods has been highlighted in a Taiwanese study (Ho, 2004). It explored validity of this method applying it on the data obtained from the Creative Thinking Tests, and probing the results by Principal component analysis. That study showed that the topological structure of the thinking styles and the formed clusters detected by SOM, could be confirmed by Principal component analysis. The reliability of results was determined to be clearly superior to results obtained by traditional methods. This conclusion can somewhat reduce the uncertainty which is often related with the use of unconventional means. On the basis of the previous discussion, and the fact that the citation rate of Kohonen's SOM work is over 7000, SOM can be considered to be—apart from a method for understanding one's data, useful in presenting, and a complementary tool in analyzing—also a reliable method.

In addition to significance testing, the magnitude of the effect is reported, as recommended (cf. Nummenmaa, 2005). The effect sizes, r correlation coefficients, eta squares and R squares were interpreted—in addition to Cohen's criteria, in the framework of the prior reported research results, and common knowledge of the psycho-socio-educational field (i.e., effect sizes in social research in general vary between small to medium), as it is recommended (cf. Weinfurt, 1995; Thompson, 2006).

4 The Basic Needs Fulfilment Study

4.1 Description of the BPNS

The Basic Needs Satisfaction at Work (BPNS) examines the basic psychological needs for autonomy, relatedness and competence at work. In this study the questionnaire was applied to the educational context: needs fulfilment in schools. The questionnaire originally consists of 21 multiple-choice items using a 7-point Likert scale (1 not at all true – 2 – 3 – 4 somewhat true – 5 – 6 – 7 very true). Three subscales, variables of sum, were formed according to the original measure validation study (SDT-theory, homepage 2005), except that one of the questions (F 11) was left out because it lowered the reliability. For studies, which have used BPNS, see Baard, Deci & Ryan, 2004; Deci et al. 2001; Ilardi, Leone, Kasser & Ryan, 1993; Kasser & al., 1992.

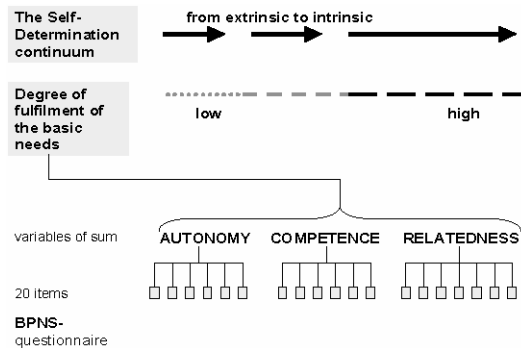


Figure 8. The BPNS-variables of sum in relation to self-determination continuum.

4.2 Results

4.2.1 Validity of the measure

In order to examine the hypothesis of basic needs fulfilment being intertwined the intercorrelations and the data structure were studied. The strongest correlation between the basic needs was found between competence and autonomy ($r=.57$, $p<.001$), then between autonomy and relatedness ($r=.52$,

$p < .001$), and the weakest between competence and relatedness ($r = .44$, $p < .001$).

4.2.2 Descriptives of the basic needs and comparison between the independent participant variables

Whole sample

In the whole sample the means of the basic needs fulfilment variables varied between 4.7 and 5.0. (Table 3), which shows that on average students have used the higher half of the scale (1–7). The paired samples t-test showed that the mean of relatedness was the highest in this sample, then those of competence and autonomy. The paired sampled t-tests: autonomy-competence [$t(787) -8.14$, $p < .001$]; autonomy-relatedness [$t(787) -10.88$, $p < .001$]; competence-relatedness [$t(784) -3.32$, $p < .01$];

Gender and basic needs fulfilment

Girls had significantly higher scores in autonomy [$F(1,787) 4.93$, $p < .05$, $\eta^2 = .01$] and in relatedness [$F(1,787) 12.54$, $p < .001$, $\eta^2 = .02$] than boys. In competence the difference was non-significant (Table 5).

Educational group (3)

The different types of educational groups and the basic needs variables were first examined by comparing general, special and selective education (GEN/SEN/SEL), and after that more specifically by the type of class. One-way analysis of variance revealed that all differences between GEN/SEN/SEL were significant: in autonomy [$F(2,787) 5.79$, $p < .01$], competence [$F(2,787) 6.37$, $p < .01$] and relatedness [$F(2,787) 14.40$, $p < .001$]. The Tukey post-hocs revealed that the special needs education differed significantly from the general and selective education, but they not from each other (Table 6).

Educational group (8)

The basic needs means of specific educational groups (Table 33, Appendix) were compared by one-way Anova and the differences were significant: in autonomy [$F(7,787) 4.54$, $p < .001$], competence [$F(7,787) 4.42$, $p < .001$] and relatedness [$F(7,787) 6.15$, $p < .001$]. The Tukey post hocs revealed that the most differences existed between EB and the others: in fulfilment of all basic needs it has the lowest means (Table 8).

Elementary/middle school

The elementary school scores were significantly higher than middle school ones for competence [$F(1,787) 14.88, p<.001$] and for relatedness [$F(1,788) 4.30, p<.05$].

Table 5. Basic needs fulfillment variable descriptives by gender

gender		autonomy	competence	relatedness
Boy, n=443	Mean	4,62	4,92	4,95
	SD	,95	,92	,97
Girl, n=345	Mean	4,77	4,97	5,19
	SD	,97	,86	,97
Total N=788	Mean	4,69	4,94	5,05
	SD	,96	,89	,97

Table 6. Basic needs fulfillment variable descriptives by educational group (3)

		autonomy	competence	relatedness
GEN, n=310	Mean	4,73	4,96	5,12
	SD	,96	,90	,94
SEN, n=286	Mean	4,54	4,81	4,83
	SD	,92	,86	1,00
SEL, n=192	Mean	4,83	5,10	5,28
	SD	1,00	,90	,93

Table 7. Basic needs fulfillment variable descriptives by elementary/middle school

		autonomy	competence	relatedness
Element, n=510	Mean	4,70	5,03	5,11
	SD	,98	,88	,97
Middle, n=275	Mean	4,66	4,77	4,96
	SD	,94	,90	,98

Table 8. Posthoc comparisons in basic needs between educational groups (8)

auto	Means lower than in	p
EB	GEN,LA,MUS,ENG	.000-.030
LD	MUS	.017
GEN	MUS	.039
comp		
EB	GEN, LA, MUS, ENG	.000-.003
rela		
EB	GEN, LA, MUS, ENG	.000-.013
NO	MUS	.002
LD	MUS	.038

4.2.3 Basic needs fulfilment profiles of the independent participant variables

The one-way analysis of variance shows separately the level of each basic need by the independent participant group. In order to analyze the relative role of each basic need within the group, profile analysis was used. The basic needs form a genuine multi-variable set thus fulfilling the prerequisite for using the MANOVA profile analysis.

The first profile analysis was conducted for boys and girls (Figure 9). The profiles (age as a covariate) were found to be non-parallel, which means they deviated by shape and there was an interaction effect (Wilk's Lambda $F=4.85$, $p<0.01$, $\eta^2= .01$). The girls' profile was higher than the boys. The profile for girls was lowest in competence, but in boys' profile it was the highest.

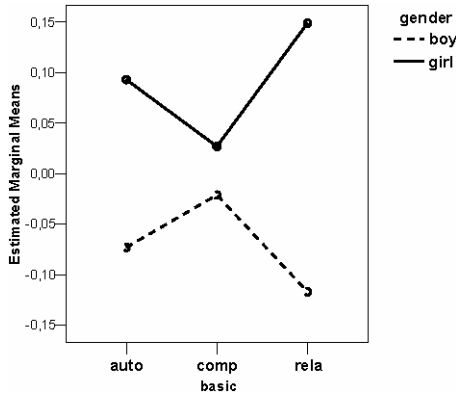


Figure 9. The basic needs fulfilment profiles by gender (lower profile=boys’).

The profiles (Figure 10) illustrate basic needs fulfilment combination of the educational groups GEN/SEN/SEL (age used as a covariate). The profiles were tested to be parallel ($p=.249$), although the visual observation would have had it otherwise. The profiles did, however differ in flatness (Wilk’s Lambda $F=4.79$ $p<.01$, $\eta^2=.01$), so the means of the basic needs fulfilment deviated from each other. The profiles of special, general and selected education deviated from each other in level [$F(2,781)$ 13.49, $p<.001$, $\eta^2=.03$]; the profile of SEN was lower than SEL ($p<.001$) and GEN ($p<.001$).

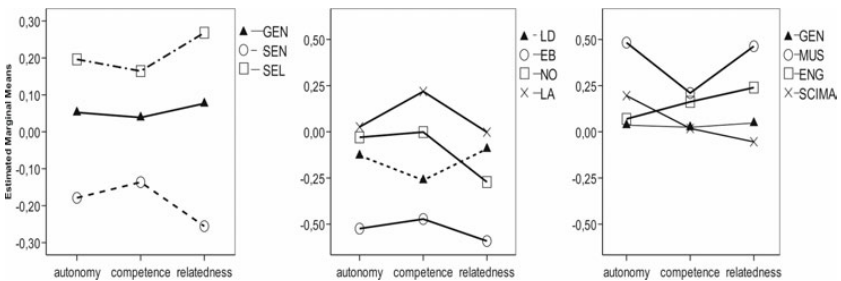


Figure 10. The basic needs fulfilment profiles by GEN/SEN/SEL education (sig. differences SEN–GEN, SEL) and by edgroups(8) (sig. differences: LD–MUS; EB–NO, MUS, LA, ENG, GEN; NO–MUS).

In the middle and the right figure the special and selective education profiles have been “opened” and the profiles show the levels and the highest and lowest points of a specific educational group. The profiles were tested and found

to be parallel ($p=.116$), and they did not deviate in flatness either ($p=.052$), however there was a difference in the level [$F(7,776) 6.94, p<.001, \eta^2=.06$].

When the profiles were observed graphically, LA peaked in competence and EB's profile differed most from others, was the lowest being also quite flat. LD had the second lowest profile and its lowest point was competence. The lowest point in the NO group was relatedness. Overall the profiles of the selective education were nearer to each other. Figure 11 shows the profiles into elementary and middle level.

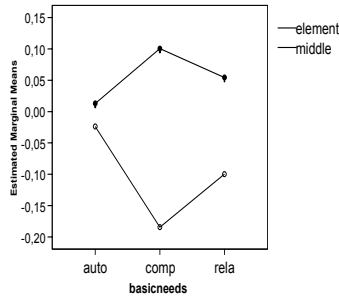


Figure 11. The basic needs fulfilment profiles by elementary/middle level (lower profile=middle school).

The profiles of elementary and middle school were not parallel (Wilk's Lambda $F=6.58, p<.001, \eta^2=.02$). Graphic observation showed that where the elementary school had a peak in competence, the middle school had a gap. In autonomy, they did not deviate much, for relatedness the elementary profile was higher in level.

4.2.4 The multi-factorial analysis of variance on basic needs fulfilment

The independent participant variables may have an effect on basic needs fulfilment when they are studied alone without any other factors. A more comprehensive picture emerges when multi-factorial analysis of variance is used because then the *relative* impact of each factor in a model will be revealed. The three models (presented in the procedures section) were tested on each basic need variable.

a) Autonomy

No significant effects appeared in the second model gender (2) x edgroup (8) x age continuous

1. model: gender (2) x educational group (3) x age (continuous)

In the final model an interaction effect of age and GEN/SENSEL was detected on autonomy [F(1,784) 6.06, $p < .01$, $\eta^2 = .02$], and in addition, a main effect of age [F(1,784) 10.01, $p < .01$, $\eta^2 = .01$] and GEN/SEN/SEL [F(2,784) 4.64, $p < .01$, $\eta^2 = .01$].

Because of the interaction effect, the analysis continued by examining the groups separately. In selective education age had an effect on autonomy [F(1,192) 16.35, $p < .001$, $\eta^2 = .08$] (Figure 12), more age, higher autonomy. In other groups age was non-significant.

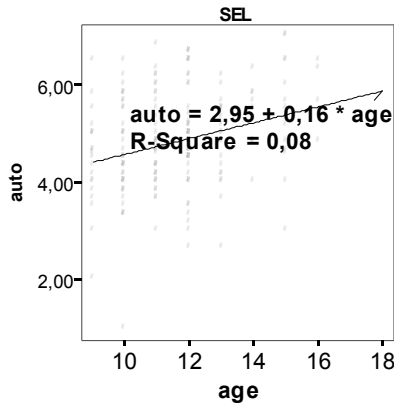


Figure 12. The effect of age on autonomy in a separate SEL group.

3. model: gender (2) x educational group (3) x elementary/middle (2)

A main effect of GEN/SENSEL appeared in the final model on autonomy [F(2,787) 8.70, $p < .001$, $\eta^2 = .02$]. In addition, there was an interaction effect between elementary/middle school and GEN/SEN/SEL [F(2,787) 4.96, $p < .01$, $\eta^2 = .01$].

The split test showed that in elementary level the educational groups differed [F(2,509) 3.77, $p < .05$, $\eta^2 = .01$]; SEN (estimated $M=4.55$, $SD=.08$) scored lower than GEN ($M=4.81$, $SD=.07$). In middle level the groups also differed [F(2,227) 7.79, $p < .001$, $\eta^2 = .05$]. The SEN ($M=4.54$, $SD=.09$) differed from SEL ($M=5.20$, $SD=.15$).

The elementary/middle had an effect in SEL-group on autonomy [F(1,192) 6.58, $p < .05$, $\eta^2 = .03$]. In the middle level in SEL-group the autonomy experience was better (M=5.20, SD=.16) than in the elementary level (M=4.71, SD=.08).

b) Competence

1. model: gender (2) x educational group (3) x age (continuous)

In the final model on competence age and GEN/SEN/SEL had an interaction effect with age effect [F(2,784) 3.85, $p < .05$, $\eta^2 = .01$], and GEN/SEN/SEL a main effect [F(2,784) 3.24, $p < .05$, $\eta^2 = .01$]. The main effect of age was non-significant in the final model.

The split inspection revealed that in SEL age had a positive effect on competence [F(1,191) 4.01, $p < .05$, $\eta^2 = .02$] (Figure 13)

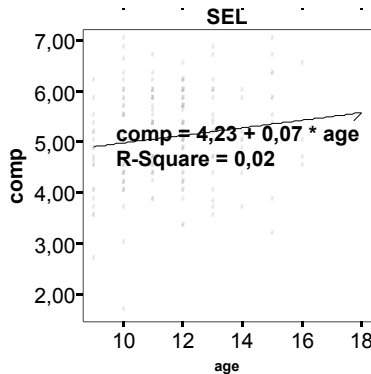


Figure 13 The effect of age on competence need fulfilment in SEL-group

2. model: gender (2) x educational group (8) x age (continuous)

There was a main effect of edgroups (8) [F(7,784) 2.51, $p < .05$, $\eta^2 = .02$] and an interaction effect between age and edgroups [F(7,785) 2.56, $p < .05$, $\eta^2 = .02$].

In split groups age affected competence positively in ENG [F(1,127) 13.026, $p < .001$, $\eta^2 = .09$].

3. model: gender (2) x educational group (3) x elementary/middle (2)

There were two main effects: GEN/SENSEL [F(2,787) 4.27, $p < .05$, $\eta^2 = .01$] and elementary/middle [F(1,787) 7.18, $p < .01$, $\eta^2 = .01$]. There was also an

interaction effect of GEN/SEN/SEL and elementary/middle [$F(2,787) 3.41, <.05, \eta^2=.01$].

The examination of split groups revealed that in elementary level the educational groups differed [$F(2,509) 6.15, p<.01, \eta^2=.02$]: Special needs education scored lower in competence (estimated $M= 4.84, SD=.07$) than general education ($M=5.13, SD=.06$) and selective education ($M=5.11, SD=.07$).

In the GEN group elementary/middle had an effect on competence [$F(1,309) 17.52, p<.001, \eta^2=.01$]. The estimated mean was higher in the elementary level ($M=5.13, SD=.06$) than in the middle level ($M=4.70, SD=.08$).

It was hypothesized that there could be a gender difference in a competence experience as a function of age. That was tested (figure 14). Gender had no main effect either.

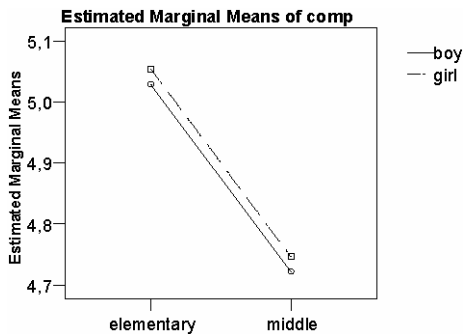


Figure 14 Competence experience among boys and girls in elementary and middle schools (circle and dashed line=girl).

c) Relatedness

(In the first and second model no significant effects emerged).

3. model: gender (2) x educational group (3) x elementary/middle (2)

In the third model on relatedness main effects had GEN/SEN/SEL [$F(2,787) 11.38, p<.001, \eta^2=.03$] and gender [$F(1,787) 6.62, p<.01, \eta^2=.01$].

SEN-group ($M=4.86, SD=.06$) differed from GEN ($M=5.13, SD=.05$) and SEL ($M=5.27, SD=.07$), they did not differ from each other. Girls ($M=5.18, SD=.05$) scored higher than boys ($M=5.00, SD=.05$).

4.2.5 Basic needs fulfilment and school achievement

The indicator of school performance, GPA, correlated with all basic need variables—most with competence ($r=.30$, $p<.001$), then with autonomy ($r=.16$, $p<.001$) and least with relatedness ($r=.11$ $p<.01$).

In order to find possible interaction effects the effects of the independent participant variables on GPA were tested first by the GLM Univariate by the following models: 1. gender (2) x educational group (3) x (continuous) age, and 2. gender (2) x educational group (8) x (continuous) age, and 3. gender (2) educational group (3) x elementary/middle school (2).

Because no interaction effects were found in the second model, the basic needs variables were entered in the linear regression analysis along with gender, age and educational group (8). The final model explained 44% of the GPA variance. Of the basic need variables autonomy was non-significant, competence explained 6%, relatedness had a slight negative effect. The strongest explainers were LD- and EB-groups, both 10% and NO-group was almost as strong (more or almost a grade off). SCIMA, LA and MUS along with gender and age had a small effect each. The effects of special needs groups were negative. ENG had no effect at all. (Table 9).

Table 9. Significant explainer on GPA in a model with basic needs, educ. group(8), gender and age

	B	Std. Error	Std. Beta	t	Sig.	Part corr	Expl. %
(Constant)	10,17	,43		23,90	,000		
comp	,27	,03	,27	8,47	,000	,24	6
rela	-,11	,03	-,11	-3,52	,000	-,10	1
LD	-1,12	,10	-,33	-11,66	,000	-,32	10
NO	-,94	,09	-,30	-10,06	,000	-,28	8
EB	-1,14	,10	-,35	-11,43	,000	-,32	10
LA	-,40	,09	-,13	-4,27	,000	-,12	1
SCIMA	,81	,18	,13	4,55	,000	,13	2
lkmus	,24	,11	,07	2,24	,025	,06	.05
gender	,15	,05	,08	2,82	,005	,08	1
age	-,05	,01	-,11	-3,65	,000	-,10	1

a Dependent Variable: GPA

Because an interaction effect was found in the first model: between educational group (3) and age [F(2,739) 6.09, $p<.01$, $\eta^2=.02$] and in the third model between educational group (3) and elementary/middle school: [F(2,742)

11.38, $p < .003$, $\eta^2 = .02$] simple regression analyses were carried out in groups involved.

The analysis showed that in special education becoming older was related to decreasing GPA [$F(1,277) 14.52$, $p < .001$, $\eta^2 = .05$] and there was a slight indication of that also in general education. In selective education the direction was the opposite, but the result did not reach significance.

In the three educational groups GEN/SEN/SEL the final model with only significant variables explained GPA almost equally in SEN education (18%), and in SEL (17%), but less in GEN (11%). In all groups competence explained most of the basic needs variables. It was the strongest explainer of all factors in GEN (11%). In SEL it explained 6% and the explanation percentage was smallest in SEN, only 2%, same as that of relatedness. The effect of relatedness was in GEN and SEN negative – in SEL it had no effect on GPA. The effect of autonomy was significant only in GEN, and the effect was negative. (Table 10).

Table 10. Significant explainer on GPA in a model with basic needs, gender and age in split general, special and selective education

		B	Std. Error	Std. Beta	t	Sig.	Part corr	Expl %
GEN	(Constant)	7,47	,27		27,27	,000		
	auto	-,13	,06	-,17	-2,31	,022	-,125	2
	comp	,35	,06	,41	6,12	,000	,332	11
	rela	-,11	,05	-,13	-2,02	,044	-,110	1
SEN	(Constant)	6,096	,335		18,206	,000	,142	2
	gender	,251	,096	,14	2,602	,010	-,209	4
	elemmidd	-,349	,091	-,21	-3,820	,000	,343	12
	comp	,355	,057	,37	6,272	,000	-,135	2
	rela	-,122	,049	-,15	-2,471	,014	,142	2
SEL	(Constant)	6,33	,35		17,92	,000		
	gender	,27	,10	,20	2,71	,007	,198	4
	elemmidd	,44	,11	,28	3,83	,000	,280	8
	comp	,18	,05	,25	3,40	,001	,248	6

a Dependent Variable: GPA

When elementary and middle school was split, the total model explained 48% of the variance in the middle level, 33% in the elementary level. In both competence and relatedness were significant but in the middle level compe-

tence explained more (8%) than in the elementary level (5%). Being in SEN affected GPA a little more in the older group, and being in SEL had no effect in the younger group. The effect of relatedness was negative. (Table 11)

Table 11. Significant explainer on GPA in a model with basic needs, educ. group, and gender in split elementary and middle school

		B	Std. Error	Std. Beta	t	Sig	Part corr	Expl %
element	(Constant)	7,87	,26		30,23	,000		
	gender	,15	,07	,09	2,29	,022	,087	1
	comp	,25	,04	,26	6,00	,000	,228	5
	rela	-,08	,04	-,10	-2,14	,033	-,082	1
	SEN	-,83	,07	-,48	-12,19	,000	-,464	22
middle	(Constant)	7,39	,39		18,71	,000		
	gender	,31	,09	,15	3,29	,001	,145	2
	comp	,36	,05	,31	6,52	,000	,287	8
	rela	-,18	,05	-,17	-3,49	,001	-,154	2
	SEN	-1,15	,10	-,54	-11,43	,000	-,503	25
	SEL	,49	,14	,16	3,43	,001	,151	2

a Dependent Variable: GPA

The VIF- values were examined and they remained in all models clearly under the critical value of ten: 1.03–1.74, and the tolerance values were .57–.97, which indicated that multicollinearity would not make the model unstable.

The effects of the independent participant variables and basic needs fulfilment on GPA are presented next (figure 15). (Note: the simple models obtained due interaction effects are not counted with).

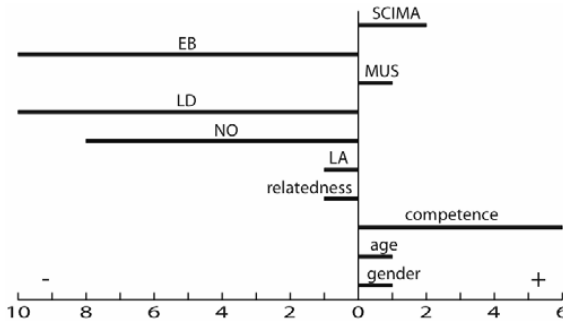


Figure 15. The effects of independent participant variables and basic needs fulfilment on GPA.

GPA was then classified into five percentiles and the basic needs fulfilment was compared by group. In autonomy the groups differed significantly [F(4,741) 5.05, $p < .01$]: the lowest from the highest and second highest. In competence the groups differed, as well [F(4,741) 12.67, $p < .001$]: the lowest from all the others and the highest from all the others. In relatedness there was a difference, too [F(4,741) 2.63, $p < .05$]: the lowest group differed from the second highest.

Basic needs fulfilment profiles were produced for each percentile. They were found not to be parallel [Wilks lambda F 4.38, $p < .001$, $\eta^2 = .02$], and, thus, differed significantly in shape. The highest GPA profile was connected to the highest autonomy and especially competence, but relatedness was only the second highest. The lowest GPA profile was the lowest in autonomy and especially in competence. (Figure 16).

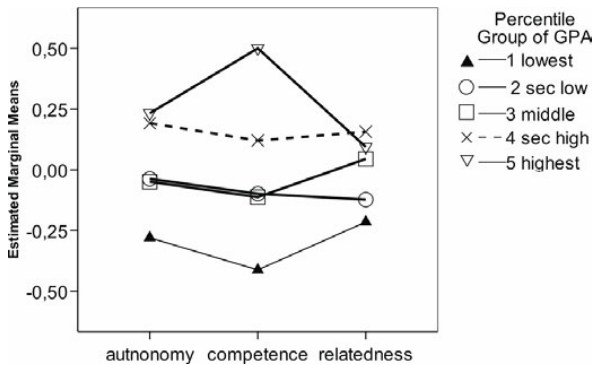


Figure 16. The basic needs fulfilment profiles of the five GPA percentiles (significant differences 1: 4,5; 5: 1,2,3).

Reliability of the regression analyses and diagnostics of the models

In order to examine the reliability of the regression analyses, the datum was cross-validated by splitting it into two and conducting separate regression analyses. The entered variables included the BPNS basic needs variables, gender and age as independent variables and GPA as dependent test variable. The explanation rates of the models were very similar (Rsq1= .16, Rsq2= .19). The same standardized beta coefficients were significant in both models; only relatedness did not quite reach significance in the first model ($p = .394$). The results supported the reliability of the analyses.

The case-wise residual diagnostics of all presented models showed that there were 0 to 5 cases with residuals more than 3 standard deviations apart from what was predicted, which was not so much that it could have harmed

the model fitting the data (cf. Muijs, 2004). The residuals diagnostic showed that the residuals were normally distributed, which supported the models.

4.2.6 Overall well-being

According to the SDT-theory, if one feels psychologically well all the three needs have to be fulfilled. The percentage of those students remaining in fulfilment of all basic needs under the absolute mean of 4.00 was studied. Of the total sample 11% (89/789) scored under the absolute mean of 4.00 in a scale of 1–7 in the basic need sum variable. This varied by educational group (general education 11%, special needs 14% and selective education only 8%). Boys were more in risk than girls. (Table 12).

Table 12. Within group portions scoring under 4.00 all three basic needs fulfilment

within group	frequency < 4.0	%	within group	frequency < 4.0	%
middle	37	13	EB	21	31
elementary	52	10	NO	4	6
boy	60	14	LD	8	13
girl	29	8	LA	5	8
SEN	40	14	SCIMA	2	13
GEN	33	11	MUS	3	6
SEL	16	8	ENG	11	9

The percentages of the girls was almost equal in the three educational groups (general education 9/special 10/selective 10). Instead the percentages of boys varied a lot more (general 13/special 16/selective 10). If the needs were studied separately, most deprived was autonomy (19%, 150 students/789), then relatedness (13%, 102 students/789) and competence (12%, 94 students/789).

4.3 Conclusions of the basic psychological needs fulfilment study

The basic psychological needs fulfilment study describes and compares experiences of subjective well-being (SWB), the degree and quality of fulfilment of the three basic psychological needs in different educational groups, general, special needs and selective, and in relation to age, gender and city. It also adds to our knowledge of the connection between school achievement and basic needs variables.

When comparing the results with prior research, it must be borne in mind that there are differences between the research designs and various other aspects. Only rough comparisons are possible and at a superficial, general level, but they can hopefully, in spite of this, add some understanding to the matters.

The first question was how the basic psychological needs were fulfilled at school. In the following this question is answered hypothesis by hypothesis.

H 1: The fulfilment of different basic needs is intertwined.

The *relatedness* need was dominant in this sample, then the *competence* need and after that the *autonomy* need (based on the paired samples t-test). This empirical study confirmed the research hypothesis based on prior results stating that the fulfilment of the three basic needs is intertwined (La Guardia & al., 2000). The correlations were largest between *competence* and *autonomy*, as was hypothesized based on Reeve's research (2002); the correlation between *autonomy* and *relatedness* was almost as high, and the correlation between competence and relatedness was smallest. What this means is that one need's fulfilment tends to require the other factors: the more there is *competence*, the more *autonomy* and *relatedness* is present as well, and vice versa: the less *competence*, the less *autonomy* and *relatedness* (see especially the results of selected and EB- and LD-groups).

H 2: The basic needs fulfilment does not vary with gender (but if there is a difference, it tends to level off with age).

The one way analysis of variance indicated better well-being for girls based on the autonomy and relatedness needs. The autonomy result is not in line with the results of Grolnick and Ryan (1990), which showed that girls felt more autonomous, both in LD and non-LD groups. It is in accordance with the results of Deci and al. (1992), which indicated no differences between genders in autonomy. When other factors got involved in the factorial analysis of variance, girls and boys did not differ in *autonomy* need.

The means of boys and girls did not differ in *competence* according to the factorial analysis of variance, and this resulted in confirming the null-hypothesis by solely using statistical significance as a criterion. This result was in line with a recent review of competence/gender issue: most studies show either no or minor differences¹² in global academic competence (Hyde

¹² One suggestion of reason—if and when—girls report lower competence is that the reason lies rather in the different way girls and boys express their experiences: girls might be (and are ex-

& al., 2005), and also to correspond results of e.g. Harter (1999) who found no gender differences in competence in the academic and social domain. Recent Finnish results indicated that boys felt more competent than girls; but this study examined the experiences in specific domains of importance (Salmela, 2006), not the overall competence experience. However, also in this present study, the results of the profile analysis indicated that the *competence* need is relatively more critical for girls than boys: in girls' it was the lowest fulfilled of the basic needs, their weakest point, in boys' the highest, their strongest point. This seems to show a similar pattern as the result of Learning to Learn study of girls' belief in their abilities in Math (see section 1.1.3). Further the results of the mentioned study indicated that although there was a slight hint that in the sixth grade the competence beliefs of boys were higher than those of girls, the explanation remained around 1% or less (Hautamäki & al., 2005).

The null hypothesis was rejected also based on the factorial analysis of variance in *relatedness*: girls felt significantly more related to others than boys; however, the effect was small. In a model with educational group and elementary/middle school, it was less important than educational group, but even though significant, having only a minor explanation rate. The effect of elementary/middle school was in this model non-significant. According to the basic needs fulfilment profiles, *relatedness* was the weakest point of boys, but the strongest of girls. Overall the girls' profile was significantly higher than the boys'.

In sum: The psychological well-being at school of girls was found to be partly better than that of boys. Within the gender basic needs satisfaction varied. Overall the basic needs were well fulfilled because in the absolute scale the means were over average of 4.

H 3: Fulfilment of psychological needs is more threatened in special education.

The results confirmed the hypothesis and were in line i.e. with the results of Deci et al. (1992) and Grolnick et al. (1990): the needs were more deprived in special education than in general education. Having no prior results, which had compared those two plus selective education, as was done here, it was a logical result, however, that also selective education groups turned out to

pected to be) more modest, and boys more courageous to acknowledge they feel competent (cf. Pintrich & al., 1996).

have significantly higher values for all three variables than special needs education.

When general/special/selective education was used as a factor along with continuous age or elementary/middle school and gender, age had a significant role on *autonomy* in selective education but not in the others; in selective education higher age was connected with better satisfied *autonomy* need. Similarly on *competence* in SEL age had a significant, although a small positive effect. The inspection in the model with the more specific educational group (8) revealed that the effect was related to ENG-group: in that group age affected GPA by, the effect size being .09. In the elementary level the educational groups differed: Special needs education scored lower in autonomy and competence than general education and in competence than selective education. In the middle level special needs group scored lower than selective education group, and the effect size was .05, which was bigger than in the case of the other differences. In special needs group the mean of relatedness was lower than in the other groups. Of *relatedness* the educational group explained 3%—special needs education had a significantly lower relatedness mean than the other groups.

The profiles were found to be parallel, which meant that within the general, special or selective education group the interrelationships between the fulfilment of the basic needs variables were similar, had a same role in each group, although the profile was significantly lower in special education than in the other two groups.

H 4: Criticality of the different psychological needs fulfilment varies between different special education groups (autonomy is more likely to be in jeopardy in the groups with emotional and behavioral needs, competence in the groups with learning difficulties).

This study confirmed that ‘special education’ was not a homogeneous group, but the fulfilment rate of the basic needs varied. Being in LA, MUS, GEN and ENG-groups was related to a significantly better well-being than being in an EB-class, based on the means comparisons of all three needs, which was concretely seen in the basic needs fulfilment profiles. Being in LD-group had a significant negative effect on autonomy and relatedness and in NO-group on relatedness, specifically compared to the music class. The factorial analyses revealed that educational group had a main effect of 2% explanation rate in competence. There was also an interaction effect which indicated better competence experience for English students the older they were.

The results did only slightly support the findings of Grolnick and Ryan (1990). They compared *autonomy* in four groups: 1. LD, 2. matched-IQ non-LD, 3. randomly selected non-LD and, 4. low achieving. They found a difference between the groups with learning difficulties and those without: the LD group was significantly less autonomous. In this study the LD-group only differed significantly from MUS-group.

There was an indication that the well-being experience of the LA-group might be better than in the other special needs groups. This group had higher values in all needs than others—in *competence* better than the general and selective education groups; however, significantly it differed only from EB. The reason for the good basic needs fulfilment values of this group might be that, at least to some extent, educational arrangements and organization for the LA-group have been successful. The academic standards are lowered (which is the difference from the others), and evaluation is done according to individual learning plans. The education of the LA-groups in this sample happened mostly in segregated schools (another difference between others), which has been critically debated over the last few years. Would the results have been even better, if the students had been in an inclusive setting? The answer to this question could be “yes”, and thus this result does not support or condemn either system. The results of LA-group can be seen supported by the notion that the individual “social norm of reference” promotes the development of self-efficacy expectations—which is related to *competence* experience -independent of the others’ results (cf. Spinath & al., 2005).

The graphic observation confirmed that competence was the strongest point in LA- group, the weakest in LD-group. Relatedness was the weakest point in NO-group, and the profile of EB-group was overall low and flat.

Thus, it seems justified to conclude that psychological well-being was overall critical for the groups of emotional and behavioral needs and *competence* need for the LD groups, relatedness for the NO-group (cf. Deci & al., 1992). On the other hand, it has to be realized that the interpretation of ‘criticality’ is relative: even the lowest means were in one to seven Likert scale over average, i.e., over four. Then, what is equally important to understand is that using the means and correlations as the basis of analysis only shows that average and individual variety remains hidden. Thus, in order to find out also the individuals, who really do not feel psychologically well, or in at the other end feel extremely well, in addition other means should be used.

The basic needs fulfilment means of selective education groups did not differ significantly from each other or that of general education. The profile of the English group was high in *competence* and *relatedness*; the weakest point was *autonomy*. In the Music group the weakest point was *competence*,

autonomy was the strongest. The profile of SCIMA was flat. Figure 17. summarizes the differences between the educational groups in basic needs fulfilment. The lines indicate significant differences using educational dummy-variables, i.e. between a specific group and all the others group (above higher means, below lower).

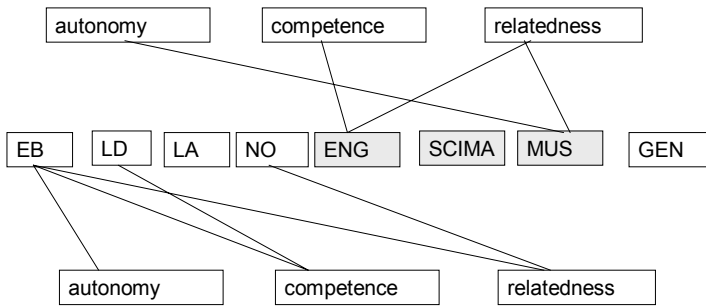


Figure 17. The significant connections of the educational groups to different basic needs fulfilment (above: higher means, below lower means in the specific educational groups than in all the others group).

H 5: The basic needs fulfilment experiences do vary with age; transition from elementary to middle school is an essential factor.

That the basic needs fulfilment varies with age seemed to be confirmed in regard with competence and relatedness on the basis of one way analysis of variance. However, the factorial analysis of variance revealed that there were interaction effects between age and educational groups. A further inspection showed that age had a significant role in relation to autonomy in selective education, explaining 8% of the variance (but not in general or special education): the older the students were the better the need was fulfilled. Similarly the autonomy experience differed between dichotomous age categories, elementary and middle levels in selective education: the middle level scored higher.

The *competence* experience has been observed to decline during early adolescence and adolescence (Anderman & Maehr, 1994; Wigfield & al., 1997, Wigfield & al., 2005; Pintrich & al., 2002) and towards the end of elementary schooling (Spinath & al., 2005). The reason for the drop in *competence* with age has been claimed to be the more realistic view of self and understanding of feed-back from others. One more suggestion has been that the older the students become the more alternative activities they have available,

and, when school has to compete with those other attractions it many times it loses the battle—and this reduced engagement produces poorer results and logically a lower competence experience (cf. Wigfield & al., 2005).

In this study, in the end of the elementary school, in the sixth-grade the *competence* experience was at its best, but after that, the values dropped. There was a slight main effect of elementary/middle school; it explained 1% of the competence variance. The values dropped especially in general and selective education. It is difficult to compare the results with the earlier studies, not least, because the school entrance age varies and the transition age from elementary to middle school varies, as well. However, the peak in the sixth grade seems to be some discrepancy between the prior studies—on the other hand the decline after elementary school is in line with previous studies. Although elementary/middle school had a small effect on *relatedness* need: the elementary school's values were higher than the middle school's based on the one way analysis of variance, this effect disappeared when gender and educational group were used in a model.

When the profiles were tested, interaction effects were found to be significant, so the emphasis, the relative importance, of the needs varied by elementary and middle level. For example, in the middle level the highest need was *autonomy*, *competence* the lowest; in the elementary level was the opposite. The profile of elementary level was higher than that of middle level's.

That the needs were well satisfied in the end of elementary school, in the sixth grade, could in partly be explained by the increasing joint activities the students have in the last year of elementary school relating to the transition period. They, for example, many times organize a camp school, and preparing it and recalling their memories afterwards ties them together. Further it is likely that parents, teachers and school welfare groups increasingly focus on sixth-graders before they leave, in order to make them feel competent and safe about the change.

To conclude: when considering the profile analyses the effect of gender was the weakest on basic needs fulfilment; elementary/middle school explained 2%, the general, special, selective education factor explained more, 3% of the variance, and the explanation of more specific educational group was up 6%. In the factorial analyses gender was a significant, but weak, explainer on *relatedness*. On *autonomy* and *competence* there were interaction effects between age and educational group. The main effect of educational groups (3) explained of the variance in *autonomy* up to 2%, in *competence* only 1% and in *relatedness* 3%. The more specific educational group explained 2% of the *competence* variance. The effect of elementary/middle level was on *competence* 1%.

H 6: Basic psychological needs fulfilment is connected to school achievement.

It was hypothesized on the basis of prior research that basic needs fulfilment would have an effect on school achievement—or vice versa, because there is still confusion about the direction of the effect (cf. Wigfield & al., 2005) though the SDT-theory views the direction being from basic needs fulfilment to GPA, not the other way round. There are results of correlation of *autonomy* with achievement (cf. Reeve's meta-results 2002), of *relatedness* (cf. Wigfield & al., 2005) and especially of *competence* (cf. Wiest & al., 1998).

In this sample GPA correlated most with *competence*, less with *autonomy* and least with *relatedness*.

In order to examine the situation more deeply, linear regression analyses was conducted. Of the needs, competence was the strongest explaining 2–11% depending on the model. In the models having a significant autonomy effect, that effect was negative—as well, as the effect of relatedness.

Gender had a small effect; in a split analyses being a girl was shown to be beneficial for achievement in special needs and selective education (4%) – in general education there was no effect. Being a girl meant about one fourth more in GPA.

Being in elementary school was enhancing the grades in special needs group (explaining 12% of the GPA variance), but the opposite in selective education in which being in middle school enhanced the GPA (explaining 8% of the variance)

It is notable that *autonomy* affected GPA negatively in general education, although the effect was small. This result is at odds with theoretical assumptions, which indicate a positive relationship between *autonomy* experience and academic outcome (cf. Deci & al., 1992; Deci & al., 1996; Patrick & al., 1993; Wiest & al., 1998; Reeve, 2002). D'Ailly (2003), on the other hand, got a similar result. In his study the *autonomy* experience had a slight negative effect on school achievement. He explained it by cultural differences: what in Western world was experienced as *autonomy* support was in Asian culture likely to be perceived more as a lack of care.

Relatedness had, in turn, a small negative impact on GPA in special and general education, but none in selective education (for possible reasons of the negativity in effect of relatedness, see later in this chapter).

In the elementary level *competence* explained one fourth of a grade in elementary and more than third of a grade in the middle level. In the middle level relatedness affected GPA negatively. Special education had a negative effect on achievement: in the elementary school it meant less than a grade, in

the middle level more than a grade off from the GPA. Belonging to certain group – EB or LD meant over a grade decrease in GPA and also NO almost a grade. Being in SEL was beneficial for achievement in the middle level, but its effect was small.

There is a disagreement among researchers in respect to the impact of grades on competence beliefs among high-achievers. Spinath and al. (2005) argue that the competence experience is enhanced by school grades among gifted students. They further claim that competition and comparison with others have the same effect. Deci and al. (2001), in turn, state on the basis of their meta research that competition and symbolic rewards, such as school grades, lower self-determination among high-achievers, too.

The sample was ranked in five achievement groups. The highest GPA group of five differed significantly from the others in higher *competence* (and *competence* was lowest in the smallest GPA group). The lowest GPA group differed from all the others too, and it seemed that this need was emphasized/deprived mostly at the extreme ends of GPA.

This study showed that *relatedness* can have a negative effect on GPA in some groups. This might be explained by the Resource control theory (mentioned in the Introduction) which stresses that one have to balance between self and others' goals (Wigfield & al., 2005). Having a too high emphasis on relatedness, belonging, on peers, can be costly for achievement. The other slight indication (if not pure coincidence, because non-significant) of the highest GPA-group being not the most related, is interesting because it can be connected to the opposite. Stressing achievement, competence goals, might cost popularity and relatedness, if it is other referential, competitive (Elliot & al., 2002) They further claim that the competitive desire on success may also in the end affect competence need fulfilment, because a student then focus on performance and perhaps not on necessary training of skill or knowledge,

“It is even possible that the need for competence unrestrained by the occasional consideration of possible incompetence could be maladaptive, as individuals may find themselves so enthralled by the possibility of competence that potential pitfalls along the way are ignored or never even perceived. Thus satisfaction of the need for competence may lead to well-being in general, but balance within the need itself and within the broader context of personhood is important to ensure optimal functioning. (Elliot & al., 2002).

In relation to psychological well-being, and in order to let students develop in an optimal manner, the fulfilment of all three basic needs is, according to the theory, equally important. Overall students in this sample the basic psychological needs were well fulfilled. However, the results showed that the fulfilment of the needs varied group by group. An overall well-being percentage

was computed for scores remaining under the absolute mean of 4.00 in the 1–7 scale in every need. Quite a lot more boys than girls scored under the critical value and more special education boys than general and particularly selective education boys. Between the girls there was no difference. Most in risk was the EB-group: for almost every third child the fulfilment of all the needs was in jeopardy. Of the separate needs, most threatened in the whole sample was autonomy (for one fifth of the students) and then quite equally relatedness and competence (for 12–13% of the students).

The different special educational problems, learning, emotional, developmental, behavioral, showed also to be related to the distinguished well-being profiles. In addition to domination of some need, the level of satisfaction of all needs was generally low in some groups. It is also notable that the selective classes were not quite identical in their needs satisfaction, but showed different profiles. However, they turned out to experience more well-being than others did.

Age was shown to have a small effect on psychological well-being, and gender as well, although only on relatedness. However the educational group was a more prominent factor than age and gender.¹³

The relationship of school achievement and basic needs fulfilment also varied between groups. The conclusion is that it is neither enough to observe the whole student population as one “package”, nor to examine the situation only by division of the sample into general and special education.

Therefore, when interventions are planned, actors should be aware of the importance of assuring basic needs satisfaction—of course for the well-being—but also for learning and school achievement. The situation of the basic needs fulfilment should first be carefully investigated, and then those students should be prioritized, who are most in need—and those environments, which seem to be least unable to identify the basic needs fulfilment, and to promote well-being.

¹³ The effect of school was not analyzed, but it has been shown to be an important explainer: for example in experienced competence it was over 6% (Hautamäki, 2005).

5 The Academic Self-Regulation Study

5.1 Description of the SRQ-A

The Self-Regulation Questionnaire Academic, SRQ-A (Ryan & al., 1989) is targeted to the academic domain, i.e. concerning school learning of students. It consists of 32 multiple-choice questions (four alternatives: 1= not at all true, 2= not very true, 3= sort of true, 4= very true). For example, the students are asked for reasons why they do their homework, or try to answer hard questions during lessons. The questions correspond the self-regulation styles on the self-determination continuum. The variables of sum are formed accordingly: external (“exte”), introjected (“intro”), identified (“ident”) and intrinsic (“intri”) (among children rare “integrated” has been left out of the SRQ-A).

A Relative Autonomy Index (RAI) has been formed using weighted variables of sum in the formula: $2 \times \text{Intrinsic} + \text{Identified} - \text{Introjected} - 2 \times \text{External}$. RAI describes the level of autonomous behavior: the positive RAI value means autonomous behavior and the higher positive the RAI is, the more autonomous; and vice versa, negative RAI indicates non-autonomous behavior, and the higher the negative RAI value is, the more non-autonomous. Figure 18 describes the hierarchy of SRQ-A variables. In this study it was, thus, possible either to operate on the variable level or to compare the RAI scores.

There would have been an alternative to use a SRQ-A version for students with LD. Four third and fourth graders, who had learning difficulties were pre-testers and filled the questionnaire in a resource room. Because they did not have any trouble, the general version was chosen. However, during the actual study, in some special needs classes there were students (less than 10), who needed help in reading some of the questions and they were helped out. In three instances the whole questionnaire had to be read aloud by the researcher or an assistant.

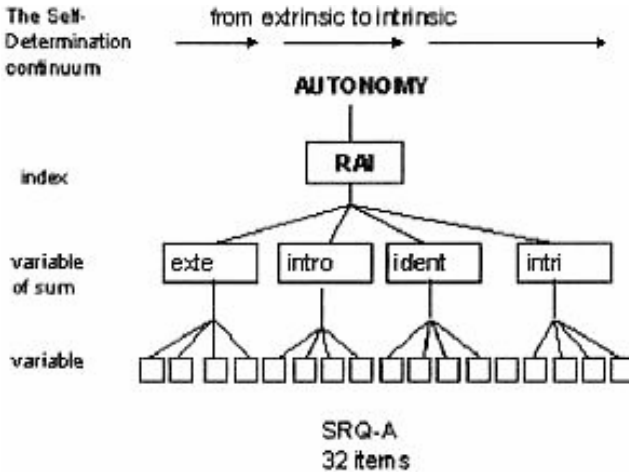


Figure 18. The variable hierarchy of the SRQ-A.

5.2 Results

5.2.1 Validity of the measure

In order to examine the hypothesis of self-regulatory styles being structured and connected as a continuum, the intercorrelations were studied. The result was logical and confirmed the assumptions of self-regulation variables forming a gradual continuum pattern (Table 13): the more external variables correlated higher with each other, and the more intrinsic variables correspondingly with each other. Introjected and identified settled in between external and intrinsic variables, as expected according to the self-determination continuum. The reliabilities of the variables of sum were good showing sufficient internal consistency (Cronbach’s alphas .79–.85).

Table 13. Correlations between the academic self-regulation variables and RAI

	external	introjected	identified	intrinsic
Introjected, n=785	,67(**)			
Identified, n=785	,39(**)	,54(**)		
Intrinsic, n=785	,25(**)	,44(**)	,61(**)	
RAI, n=771	-,56(**)	-,15(**)	,23(**)	,66(**)

In all correlations $p < .001$ (2-tailed)

5.2.2 Descriptives of the academic self-regulation variables and comparison between the independent participant variables

The paired samples t-tests showed that in the whole sample the mean of identified was the highest, second was the external, then was the introjected and the lowest was the intrinsic. The mean of RAI remained negative (Table 3). The Paired samples t-tests: external-introjected [$t(784) 2.91, p < .01$]; external-identified [$t(784) 21.29, p < .001$]; external-intrinsic [$t(784) 210.32, p < .001$]; introjected-identified [$t(784) -26.61, p < .001$]; identified-intrinsic [$t(784) 39.74, p < .001$]; introjected-intrinsic [$t(784) 9.69, p < .001$].

Gender

Girls and boys did not differ significantly in self-regulation variables (table 14).

Educational group (3)

The sample was first divided into GEN/SEN/SEL education. The correlations between the self-regulation variables were studied in each of the three groups and the result was that the patterns followed the theoretical self-regulation continuum pattern (Table 28).

The GEN, SEN and SEL education (Table 15) differed significantly in external [$F(2,784) 10.22, p < .001$], in introjected [$F(2,784) 3.64, p < .05$], in identified [$F(2,784) 4.85, p < .01$], in intrinsic [$F(2,784) 3.05, p < .05$] and in RAI [$F(2,768) 7.80, p < .001$]. The post hoc revealed that special education scored significantly lower than general and selective education in RAI, and in external higher than general education and nearly significantly than selective education ($p = .054$). In identified and introjected there was a significant difference between special and selective education, the former scoring lower.

Educational group (8)

When the more specific educational group was chosen as the independent variable (statistical descriptives, see table 33 in the Appendix) all differences were significant (self-regulation variables $p < .001$, RAI $p < .01$). The analysis was continued by multiple comparisons and examination of the post-hocs (Tukey). In external the MUS, NO and LA differed most often from the others—MUS had lower and NO and LA higher means. In introjected EB differed most by scoring lower ($\eta^2 = .04$). In identified EB, LD, GEN and SCIMA had lower means than the others (Table 16).

Elementary/middle school

When the sample was divided into two, elementary and middle school (Table 32), the first one had higher means in every variable but RAI: in external [$F(1,784) 49.60, p<.001$], introjected [$F(1,784) 21.42, p<.001$], identified [$F(1,784) 74.20, p<.001$], and intrinsic [$F(1,784) 25.04, p<.001$]. (Table 17)

Table 14. Academic self-regulation descriptives by gender

gender		external	intro-jected	identified	intrinsic	RAI
Boy, n=441	Mean	2,60	2,51	3,06	2,28	-,64
(RAI, n=431)	SD	,61	,65	,60	,68	1,55
Girl, n=344	Mean	2,57	2,58	3,12	2,33	-,49
(RAI, n=430)	SD	,59	,57	,54	,65	1,58
Total N=785	Mean	2,59	2,54	3,08	2,30	-,57
(RAI, N=771)	SD	,60	,62	,58	,67	1,56

Table 15. Academic self-regulation descriptives by educational group (3)

		external	intro-jected	identified	intrinsic	RAI
GEN, n=308	Mean	2,49	2,48	3,03	2,27	-,46
(RAI, n=303)	SD	,59	,58	,52	,64	1,63
SEN, n=285	Mean	2,71	2,54	3,08	2,28	-,86
(RAI, n= 277)	SD	,61	,67	,66	,73	1,50
SEL, n=192	Mean	2,58	2,64	3,19	2,41	-,34
(RAI, n=191)	SD	,59	,58	,51	,59	1,49

Table 16. Posthoc comparisons in academic self-regulation variables between educational groups (8)

external	Means lower than in	p
EB	NO, LA	.011-.014
MUS	NO, LA, ENG	.000
GEN	ENG, LA, NO	.000-.003
SCIMA	NO, LA	.035-.035
introjected		
EB	GEN, LA, NO, LD, ENG	.000-.001
MUS	ENG	.030
GEN	ENG	.001
identified		
EB	GEN, LA, NO, ENG	.000-.049
SCIMA	NO, LA, ENG	.000-.020
LD	ENG	.034
GEN	ENG	.001
intrinsic		
EB	LA, ENG	.000-.013
GEN	ENG	.035
RAI		
NO	MUS	.017
LD	MUS	.017

Table 17. Academic self-regulation descriptives by elementary/middle school

		external	intro- jected	identified	intrinsic	RAI
Element, n=510	Mean	2,70	2,61	3,21	2,39	-,61
(RAI, n=506)	SD	,60	,62	,52	,66	1,60
Middle, n=275	Mean	2,39	2,40	2,85	2,14	-,51
(RAI, n=265)	SD	,55	,58	,61	,65	1,49

5.2.3 Academic self-regulation profiles of the independent participant variables

The one-way analysis of variance shows separately the level of each self-regulation style and RAI by the independent participant group. In order to analyze the relative role of each self-regulation style and RAI within the

groups, the profile analysis was used. The self-regulation styles form a genuine multi-variable set so the prerequisite of using the MANOVA profile analysis was met (cf. Harter, 1999; Nummenmaa & al., 1996).

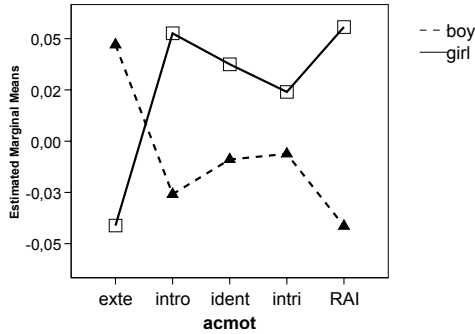


Figure 19. The self-regulation profiles of boys and girls (square=girl, triangle=boy).

Gender: The profiles of boys and girls were tested (age as a covariate) and no significant differences were found between the genders in the profiles.

GEN/SEN/SEL: The profiles of general, special and selective education were tested (age as a covariate) and found to be non-parallel (Wilk's lambda $F=7.78$, $p<.001$, $\eta^2=.04$) (figure 20). Visual inspection confirmed the test results.

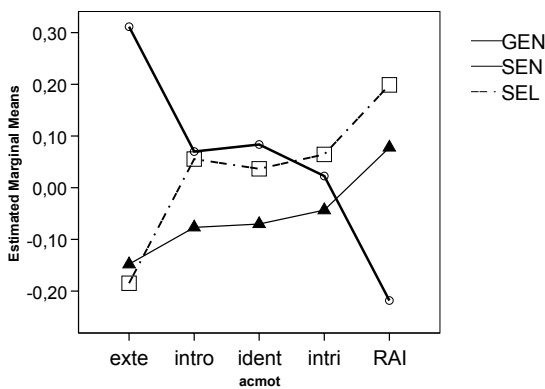


Figure 20. The self-regulation profiles of general, special needs and selective education. (square=SEL, triangle=SEN, circle=GEN)

The educational groups deviated mainly in external; this can be seen to be reflected in RAI. In external the selective education was the lowest, special education the highest.

Educational group (8): The self-regulation profiles of eight educational groups were tested and found to be non-parallel (Wilk’s lambda $F=5.02$, $p<.001$, $\eta^2= .04$). The graphic observation showed that the profiles of NO and LA classes were higher than the others (meaning that the self-regulation means were overall high). The profile shapes of special education groups were quite similar (with EB being an exception), and they deviated from the profile of general education. The selective education profiles were not similar. In the following profiles (age as a covariate) ENG-group was very similar to GEN—it only stood higher in introjected [if the age was not controlled the profile of ENG would have been different, not the profiles of the other groups. The overall level would have been higher, and especially external and intrinsic would have been in a higher level). Figure 21 shows the self-regulation profiles of the educational groups (on the left the selected ed. groups and general education, on the right the special needs groups).

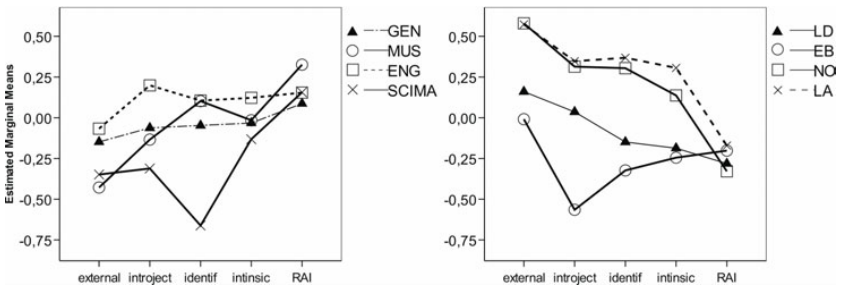


Figure 21. The self-regulation profiles of educational groups (SEL on the left, SEN right). EB; LA–GEN, LD, EB.

The profiles showed that the same RAI could be resulted from different combinations of the self-regulation styles, from profiles that were different both in level and shape. This became clear, for example, in the profiles of the LA and EB-classes.

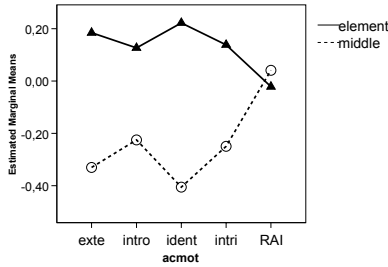


Figure 22 Self-regulation profiles by elementary/middle school (circle=middle, triangle=elementary school).

Elementary/middle school: Figure 22 shows the profiles of the elementary and middle schools. The profiles were tested for parallelism and the elementary and middle school profiles were found to be non-parallel (Wilks's lambda $F(2, 25.55, p < .001, \eta^2 = .12)$) and, thus, to deviate in shape. The profiles were significantly different, the elementary being overall in higher level peaking in identified. The profile of middle school peaked in introjected and intrinsic.

5.2.4 The multi-factorial analysis of variance on academic self-regulation variables

The models presented in the procedures section were tested on each self-regulation style and RAI.

a) External

1. model: gender (2) x educational group (3) x age (continuous, as a covariate)

There was a main effect of age on external in the final model [$F(2, 781) 49.06, p < .001, \eta^2 = .06$]. The external values decreased as a function of age.

2. model gender (2) x educational group (8) x age (continuous, as a covariate)

The main effect of age was equal to the first model.

3. model gender (2) x educational group (3) x elementary/middle (2)

The final model revealed a main effect of elementary/middle on external variable: [$F(1, 784) 54.52, p < .001, \eta^2 = .07$]. The estimated mean of elementary school ($M = 2.70, SD = .03$) was significantly higher than the mean of mid-

dle school ($M=2.38$, $SD=.04$). GEN/SEN/SEL had a main effect, too: $[F(2,784) 12.64, p<.001, \eta^2=.03]$. The Bonferroni corrected pairwise comparisons revealed that special education scored significantly higher ($M=2.68$, $SD=.03$) than general ($M=2.45$, $SD=.03$) and selective education ($M=2.48$, $SD=.04$).

b) Introjected

1. model gender (2) x educational group (3) x age (continuous, as a covariate)

One main effect appeared in the final model, GEN/SENSEL $[F(2,781) 4.29, p<.05, \eta^2=.01]$. An interaction effect of age and GEN/SEN/SEL $[F(1,920) 5.20, p<.01, \eta^2=.01]$ was found, too. In SEN ($\eta^2=.04$) introjected was the lower the older the age, and similarly in SEL ($\eta^2=.08$).

2. model gender (2) x educational group (8) x age (continuous, as a covariate)

In the final model with the more specific educational group, two interaction effects were found: age and educational group $[F(7,781) 2.47, p<.05, \eta^2=.02]$, and gender and educational group $[F(7,781) 3.26, p<.01, \eta^2=.03]$. In addition there was a significant main effect of gender $[F(1,781) 6.82, p<.01, \eta^2=.01]$ and educational group $[F(7,781) 2.67, p<.01, \eta^2=.02]$; the main effect of age was non-significant.

The analysis continued by splitting the educational group (8) due to the interaction effects. Age had a significant effect on introjected self-regulation in LD ($\eta^2=.15$) and ENG ($\eta^2=.03$) groups, (and in SCIMA, $\eta^2=.07$); the younger a student, the higher the introjected score (except in SCIMA where the opposite was true).

Then gender group was split, and the estimated means plots of boys and girls by educational group are shown in Figure 23. The differences were significant in boys: between EB and GEN, NO, LA, ENG; between NO and GEN, LD, SCIMA. Between girls there were no significant differences by educational group. (Between boys and girls the only significant differences existed in SCIMA-class: boys' estimated $M=1.98$, $SD=.11$, girls' $M=3.33$, $SD=.20$. (Note: the number of boys was 12, the number of girls was only 4).

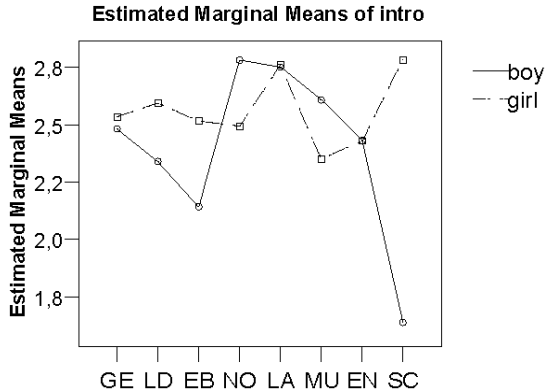


Figure 23. The estimated introjected means plot in by gender.

3. model gender (2) x educational group (3) x elementary/middle (2)

Elementary/middle school had an interaction effect with GEN/SEN/SEL on introjected self-regulation [$F(2,784) 4.56, p < .01, \eta^2 = .01$] (Figure 24), and in addition elementary/middle had a main effect [$F(1,784) 20.55, p < .001, \eta^2 = .03$]. The main effect of GEN/SENSEL was non-significant.

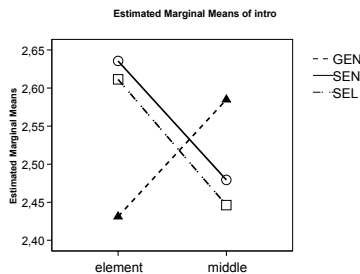


Figure 24. Interaction effect of elementary/middle school and GEN/SEN/SEL on introjected (circle=SEN, square=SEL, triangle=GEN) .

The separate group examination revealed that in elementary school GEN differed significantly (estimated $M=2.50, SD=.05$) from selective education ($M=2.70, SD=.05$) and special education ($M=2.66, SD=.05$). In middle school the differences were non-significant.

c) Identified

1. *gender (2) x educational group (3) x age (continuous, as a covariate)*

Age had a main effect on identified [F(1,920) 62.91, $p < .001$, $\eta^2 = .07$]: the younger a student, the higher the identified self-regulation.

2. *gender (2) x educational group (8) x age (continuous, as a covariate)*

In the final model with the more specific educational group as a factor, two interaction effects were found: gender and educational group [F(7,781) 2.91, $p < .01$, $\eta^2 = .03$], and age and educational group [F(7,781) 2.35, $p < .05$, $\eta^2 = .02$], and a main effect of educational group [F(7,781) 2.42, $p < .05$, $\eta^2 = .02$] and gender [F(1,781) 5.78, $p < .05$, $\eta^2 = .01$]. The main effect of age was not significant.

Because of the interaction effects, the analysis continued by split educational groups. The estimated means plots of boys and girls by educational group are shown in Figure 25. In identified girls did not differ by educational group; NO boys differed from EB and SCIMA. (SCIMA boys differed from all other boys but EB and LD by having lower identified).

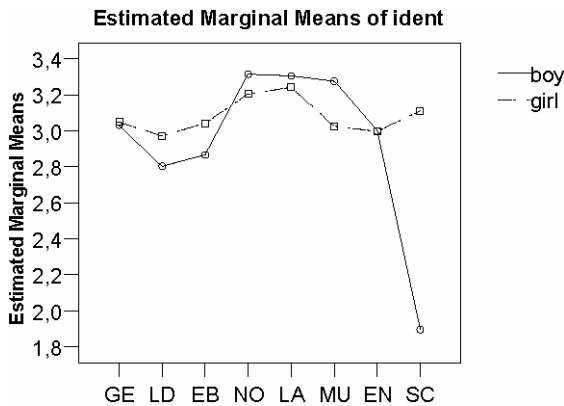


Figure 25. Estimated mean plots of identified self-regulation by gender and educational group (8) (square=boy, circle=girl).

(Girls and boys differed only in the SCIMA group: estimated M of boys=2.30, SD=.14, girls M=3.72, SD=.25). Age affected identified self-regulation significantly in some educational groups. The significant effects in order of height were: LD ($\eta^2 = .24$), ENG (.13) and GEN (.06). The direction was: the younger the students, the higher was identified.

3. gender (2) x educational group (3) x elementary/middle (2)

One significant main effect of elementary/middle school was found [F(1,784) 74.20, $p < .001$, $\eta^2 = .09$]: in the elementary level the means were higher (estimated $M = 3.21$, $SD = .02$) than in the middle level ($M = 2.85$, $SD = .03$).

d) Intrinsic

1. model: gender (2) x educational group (3) x age (continuous)

Age had a significant main effect on intrinsic self-regulation [F(1,784) 22.59, $p < .001$, $\eta^2 = .03$]: intrinsic self-regulation decreased as a function of age.

2. model: gender (2) x educational group (8) x age (continuous)

In the final model, in which the more specific educational group was entered as a factor, the main effect of educational group was found [F(7,781) 3.06, $p < .01$, $\eta^2 = .03$]. In addition, an interaction effect appeared: gender and educational group [F(7,781) 2.81, $p < .01$, $\eta^2 = .03$], and age and educational group [F(7,920), 2.35, $p < .05$, $\eta^2 = .02$]. The main effects of age and gender were non-significant. The analysis continued by splitting the educational group.

In split educational groups age affected intrinsic self-regulation equally in LD and ENG ($\eta^2 = .09$), in GEN less ($\eta^2 = .01$). The effect was negative: the more age the less intrinsic.

Figure 26. shows the estimated intrinsic means plotted by educational group and gender. In the boys' group, NO differed in intrinsic self-regulation significantly from EB; in the girls NO differed from LA-group. Against the common trend NO-boys scored higher than NO-girls (boys estimated $M = 2.47$, $SD = .09$, girls $M = 1.81$, $SD = .17$. Note boys $n = 56$, girls $n = 15$). (In SCIMA boys had lower means: $M = 1.95$, $SD = .15$, n of boys 12) than the girls ($M = 2.86$, $SD = .30$, n of girls 4).

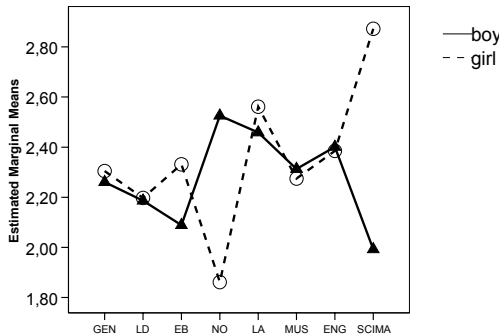


Figure 26. An interaction effect of gender and educational group on intrinsic self-regulation (circle=girl, triangle=boy).

3. model: gender (2) x educational group (3) x elementary/middle (2)

Elementary/middle school had a main effect on intrinsic self-regulation [F(1,784) 25.04, $p < .001$, $\eta^2 = .03$]. The estimated mean was significantly higher in the elementary level ($m = 2.31$, $SD = .03$) than in the middle level ($M = 2.14$, $SD = .04$).

e) RAI

(No significant effects appeared in the first and second models)

3. model: gender (2) x educational group (8) x age (continuous)

A main effect of educational group was found [F(1,770) 3.23, $p < .01$, $\eta^2 = .03$]. MUS-group (estimated $M = -.01$, $SD = .23$) differed from LD ($M = -1.02$, $SD = .20$) and NO ($M = -1.00$, $SD = .18$).

Using a dummy variable (MUS/others) in a model (MUS/others) revealed the effect of MUS [F(1,770) 6.53, $p < .01$, $\eta^2 = .01$]. When LD/others was used, the effect of LD was [F(1,770) 5.69, $p < .05$, $\eta^2 = .01$]. Using NO/others showed that the effect of NO was: 8F(1,770) 5.01, $p < .05$, $\eta^2 = .01$].

Model diagnostic

The prerequisite of using the GLM Univariate test, the homogeneity of variance, was only partly met, because Levene's test did not show a significance level over .05 in all the tests. This may have caused some significant differences to remain unnoticed, (cf. Cramer, 2003; Munro, B. 2001). For the linear regression analysis the VIF- values were examined and they remained clearly under the critical value of ten and the tolerance values were satisfac-

tory, too, being nearer one than zero, which indicated that multicollinearity would not make the model unstable.

The found interaction effects were mostly disordinal, which means that the regression lines were found to have intersected (cf. Munro, 2001).

5.2.5 Academic self-regulation and school achievement

The indicator of school performance was the great point average, GPA, which had small to moderate correlations with self-regulation variables and RAI. The correlation between the self-regulation variables and GPA was highest between GPA and intrinsic ($r=.19$, $p<.001$) and GPA and RAI ($r=.23$, $p<.001$), negative between external and GPA.

The effects of the independent participant variables on GPA were tested by the following models: 1. gender (2) x educational group (3) x (continuous) age, and 2. gender (2) x educational group (8) x (continuous) age and 3. gender (2) educational group (3) x elementary/middle school (2).

In the second model no interaction effects appeared. An the analysis continued by using Linear regression analysis. The self-regulation variables were entered along with gender, age and educational group (8). The self-regulation variables and gender explained 1% of the GPA variance; the effect of gender was less than a percent. Of the educational groups being in LD, EB and NO explained most, and the effects were negative. (Table 18).

Table 18. The significant GPA explainers in the model with educational groups (8), SRQ-A variables, gender, age

	B	Std. Error	Std.Beta	t	Sig.	Part corr.	Expl. %
(Costant)	10,65	,42		25,18	,000		
exte	-,27	,06	-,18	-4,29	,000	-,12	1
intro	,23	,06	,15	3,58	,000	,10	1
intri	,17	,04	,12	3,84	,000	,11	1
gender	,12	,06	,07	2,20	,028	,06	0.5
age	-,06	,02	-,13	-4,22	,000	-,12	1
LD	-1,10	,010	-,33	-11,23	,000	-,32	10
NO	-,89	,10	-,29	-9,21	,000	-,26	7
EB	-1,05	,10	-,32	-10,15	,000	-,29	8
LA	-,32	,10	-,10	-3,31	,001	-,09	1
SCIMA	,83	,18	,13	4,60	,000	,13	2
MUS	,22	,11	,06	2,04	,042	,06	0.5

a Dependent Variable: GPA

Because an interaction effect was found in the first model: between educational group (3) and age [F(2,739) 6.09, $p < .01$, $\eta^2 = .02$] and in the third model between educational group (3) and elementary/middle school: [F(2,742) 11.38, $p < .003$, $\eta^2 = .02$] the simple regression analyses were carried out in groups involved.

The final model which consisted of the significant factors, explained GPA most in SEL education (17%), less in SEN (9%) and almost the same in GEN (8%). External (negatively) and introjected explained most in GEN. In GEN and SEN groups age had a negative effect on GPA. In selective education all self-regulation variables were significant predictors of GPA, intrinsic and introjected having most impact. What drew our attention was that plus external, also identified had a negative effect on GPA in selective education (Table 19). In SEN the only self-regulation variable having effect was intrinsic. Gender had an effect in SEL and SEN on GPA. (Table 19)

Table 19. The significant explainers of GPA in split GEN/SEN/SEL (SRQ-A variables, gender, age)

		B	Std. Error	Std. Beta	t	Sig.	Part	Exp l.%
GEN	(Constant)	8,52	,42		20,45	,000		
	age	-,06	,02	-,16	-2,71	,007	-,15	2
	intri	,17	,07	,14	2,36	,019	,13	2
	intro	,29	,11	,22	2,74	,007	,15	2
	exte	-,32	,10	-,25	-3,15	,002	-,18	3
SEN	(Constant)	7,40	,43		17,25	,000		
	intri	,22	,06	,20	3,35	,001	,19	4
	gender	,24	,10	,14	2,38	,018	,14	2
	age	-,09	,03	-,19	-3,20	,002	-,18	3
SEL	(Constant)	7,67	,34		22,82	,000		
	exte	-,30	,11	-,27	-2,61	,010	-,19	4
	intro	,33	,13	,29	2,54	,012	,19	3
	ident	-,25	,12	-,20	-2,00	,047	-,15	2
	intri	,36	,11	,32	3,41	,001	,25	6
	gender	,25	,10	,19	2,53	,013	,19	3

a Dependent Variable: GPA

In the elementary level the total model explained 31% of GPA variance and 44% in the middle level. In the middle level intrinsic affected more than in the elementary level. Being in SEN-group explained 25% of the GPA vari-

ance in elementary, 22% in the middle level; SEL had no effect in the elementary level, but had some in the middle level (Table 20).

Table 20. Significant explainers of GPA in split elementary and middle school (SRQ-A variables, gender, ed_group)

		B	Std. Error	Std.Beta	t	Sig.	Part	Expl. %
element	(Constant)	6,09	,22		28,26	,000		
	SEN	,88	,07	,51	12,84	,000	,50	25
	exte	-,25	,07	-,19	-3,37	,001	-,13	2
	intro	,24	,08	,18	3,16	,002	,12	1
	intri	,13	,05	,11	2,52	,012	,10	1
middle	(Constant)	5,85	,42		14,04	,000		
	intri	,34	,07	,21	4,60	,000	,21	4
	gender	,25	,10	,12	2,52	,012	,12	1
	SENothers	-1,04	,10	-,50	-10,16	,000	-,47	22
	SELOthers	,54	,15	,18	3,71	,000	,17	3

a Dependent Variable: GPA

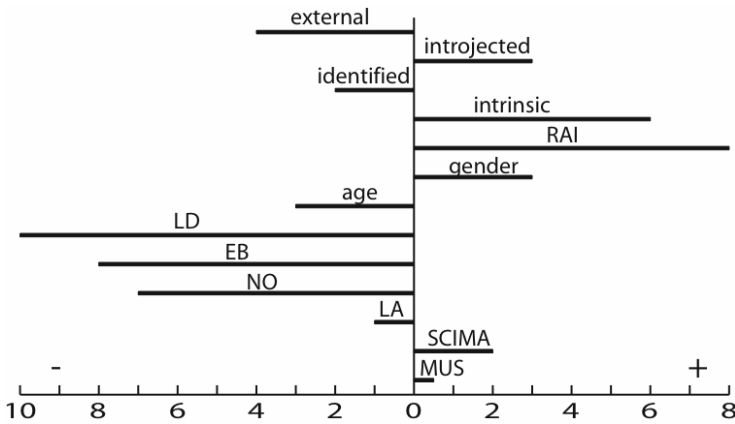


Figure 27. Percentages of different variables explaining GPA

Reliability of the regression analyses and diagnostics of the models

In all models the VIF- values were examined and they remained clearly under the critical value of ten: 1.04–1.75, and the tolerance values were .57–.97, which indicated that multicollinearity would not make the model unstable. In order to examine the regression analysis reliability, the datum was cross-

validated by splitting it into two (by coding every odd observation as 1, and every even observation as 2) and conducting separate regression analyses. The analysis included the SRQ-A self-regulation variables, gender and age as independent variables and GPA as the dependent test variable. The standardized beta coefficients were quite similar (exte: $-.38/.33$; intro: $.28/.28$; ident: $-.02/-.06$; intri: $.13/.17$; gender: $.14/.16$; age: $-.27/-.25$) and the same variables were significant in both models. The explanation rates of the models were very similar ($Rsq1 = .17$, $Rsq2 = .18$) which indicated that the analyses were sufficiently reliable.

5.3 Conclusions of the Academic self-regulation study

The self-regulatory styles of students clarify the psychological processes in school. It seems also possible to connect the empirical evidence to the theoretical model presented in the introduction section. The self-regulatory styles can thus be examined in connection with the learning orientations, which are related either to positive or negative engagement styles and coping strategies.

While the SRQ-A has been used in many studies, and the previous results will next being compared with the present results in order to find common trends, interpretations must be made with caution, because of variations research designs and cultural differences.

The third research question asked how were the academic self-regulatory and corresponding motivational styles of students at school.

The mean of *identified* was overall, across all subgroups, the highest (based on paired samples t-tests), and the same result has been reported in corresponding previous studies (e.g. Grolnick, Ryan & Deci, 1991; Patrick & al., 1993; Hayamizu, 1997; Yamauchi & Tanaka, 1998). In their SRQ-A validation article, Ryan and Connell (1989) used a sample that consisted of grades 3–6, which are equivalent to Finnish grades 2–5. When comparing the self-regulation means of the U.S. sample with the means of the nearest corresponding grades of the present study (3-5), they were very similar: external American 2.85 / Finnish 2.82; introjected Am. 2.71 / Fin. 2.75; identified Am. 3.23 / Fin. 3.30; intrinsic Am. 2.32 / Fin. 2.48.

In an American study (Patrick & al., 1993), which used SRQ-A (average age 8.3 years) the mean of *RAI* was higher than in any groups of this present study. When the results of 10 to 12 years of age (special classes excluded) were compared with the results of Yamauchi and Tanaka (1998), their students seemed to be considerably more autonomous. However, the researchers applied SRQ-A to specific school subjects, not the entire curriculum.

Identified regulation style is suggested to describe school satisfaction and willingness to accept goals of school, which means successful adjustment to being a student. If one can trust in the authenticity of the students' answers—and does not expect them to be given only, for example, to please others, i.e. researchers, teachers (related to validity of the measure)—it seems that students in general like school which is in line with the Learning the learn study results (Hautamäki, Kupiainen & al. 2005; see Introduction). They have also been able to identify goals set by others, which further indicates—according to prior results—that they would have active coping strategies. However, the weighted sum of the two more external variables was higher than the sum of identified and intrinsic, and so the *RAI* of this sample remained negative. It means that students overall felt more from outside than autonomously controlled.

The self-regulation profiles showed that the same level of the Relative Autonomy Index can result from a number of reasons depending on the relations and emphasis of the variables. While in some groups the main reason of action was, for example, anxiety, fear of shame, which manifests in introjected regulation, in others there was no prominent reason. It is also important to note that not all individuals within a group had similar profiles; instead, the group profiles just showed a general tendency.

H7: Academic self-regulation and self-regulation is structured as a continuum

The hypothesis was confirmed: the correlations between the self-regulation variables corresponded with the structure of the self-regulation continuum.

H8: The academic self-regulatory styles do not vary with gender

The hypothesis was not rejected: there were no significant differences between boys and girls, thus gender had no effect on any of the self-regulation variables, and boys and girls turned out to be equally motivated by rewards or avoidance of punishments. They were as satisfied and adjusted in school when the indicator for this was identified style. Although some small interaction effects of the gender and educational groups were found the effects were shown to relate only to two groups, SCIMA (in identified and intrinsic) and NO (in intrinsic), in which gender did affect the self-regulation or motivation style.

On introjected the factorial analysis of variance revealed an interaction effect ($\eta^2 = .03$) of gender and educational group. When the situation was

observed in split educational and gender groups, the result was that, in fact, the introjected self-regulation varied by gender—but only within the highly selected small SCIMA group, girls experiencing more anxiety and pressure in relation to schoolwork. So it seems reasonable to conclude that the introjected self-regulation of boys and girls is likely to be very similar.

The profile analysis showed that the role of the self-regulation variables was different in boys' and girls' groups: in the boys' groups *external* was emphasized, whereas among the girls' groups it was rejected; *introjected* was the lowest among the boys but highest among the girls.

As mentioned in the basic needs-section, Grolnick and Ryan (1990) showed that girls felt more autonomous both in the group of learning difficulties and non-learning difficulties. No interaction effects of gender and other factors or main effect of gender were detected in the factorial models. Deci and al. (1992) did not find any gender differences, either, when they studied the experience of autonomy in elementary level in general and special education.

H 9: The overall level of self-regulation has been shown to diminish with age; the transition from elementary to middle school is an essential factor.

The hypothesis of diminishing self-regulation, especially *intrinsic* self-regulation, along with age was confirmed based on decreasing values from elementary to middle level [Note: this is based on cross-sectional observation, so actually it is not a question of change, but differences between those levels]. This decrease was shown to happen at every stage from elementary school to secondary school, to the age 16–17. Only afterwards do the values gradually begin to increase again (Jacobs & al., 2002)—this happens later than in the present sample, in which in the end of middle school the values increase again..

In the Asian context, D'Ailly (2003) noticed, as well, that among the Taiwanese fourth to sixth graders, [i.e. in Taiwan: 9–12 years old], the more intrinsic values became lower, when the students entered to higher grade levels. Hayamizu (1997) found that in older groups of Japanese Junior high school students [in Japan: seventh through ninth grades, age 12–15], the more intrinsic values increased with age.

Previous results, such as those of Deci and al. (1992), in addition to Gottfried and al. (2001), have shown that age might not be a strong factor in self-regulation. In this study gender was the weakest factor, educational group was stronger and the relatively strongest was age.

The factorial analyses revealed that the younger the students, the more *externally* motivated (effect .06) they were. In the case of *introjected* regulation an interaction of age and educational group was found. In special needs (effect .04) and selective education (.08) more age meant less introjected, and more specifically that was true in LD- and ENG-groups. In the elementary school the introjected values were significantly lower in general than special needs or selective education. Age explained of *identified* up to 7%: the younger the students were the higher the identified. In the model with the more specific educational groups, studying the found interaction effect revealed that age affected strongly in LD (explanation 24%), in ENG (13%) and in GEN (6%). The effect was negative: the more age in these groups, the lower identified. Age had a similar effect on *intrinsic* self-regulation, and also more specifically in LD and ENG (9%), and in GEN a minor effect (1%).

The self-regulation profiles confirmed the test results: the profiles for the middle school students were significantly lower than that of younger students. Furthermore the profiles showed that the relative role of self-regulation styles changed with age: the self-regulation basis from concrete incentives and fear of punishment turned more into symbolic inner pressure and, on the other hand, to intrinsic self-regulation. Among the younger group, *external* was highest, then *identified*. In the older group in *identified* and *extrinsic* were the gaps in the profile. The effect of elementary/middle school on the self-regulation profile was 12%, so it is justified to conclude that it is an effective factor and might relate to the transition problems the prior studies indicated.

The decline in motivation can according to Anderman and Midgley (1997) be more related to learning environmental factors than be associated with physiological changes which occur due to puberty. This implies that the unfavorable development would not be inevitable, and there would be possibilities to alter the situation. In Finland steps towards that direction have already been taken: the system is changing towards to a united comprehensive school which means that the elementary/middle school borders are gradually smoothening—and probably this will affect self-regulation towards more favorable styles as a positive outcome.

H 10: The self-regulation styles vary with educational group; students with learning difficulties are less autonomous than students without learning difficulties.

The hypothesis was confirmed. On the basis of the third factorial model the special needs group deviated from the general and selective education be-

cause of its higher *external* values. It means that individuals in this group take action in order to gain incentives or avoid punishments. In especially selective education, but somewhat also in special education, lower age was connected to more external self-regulation.

The one-way analysis of variance showed that special education group had significantly lower *RAI*-values than the others. However, the behavior control also of the general and selective groups, relied more on parents' or teachers' shoulders than on their own, because the *RAI* remained negative. In the factorial analysis of variance only the more specific educational group was significant (not the GEN/SEN/SEL). As hypothesized, being in groups with learning difficulties, in LD and NO, was connected to lower autonomy. The same results were presented in the previously mentioned study of Grolnick and Ryan (1990). They found a difference between groups with learning difficulties and those without: the LD group was significantly less autonomous.

More emphasis on *external* in the self-regulation continuum has been shown to be related to 'opposition' coping strategy and avoidance orientation, and to lead to students with lower performance and a negative self-image. The NO and LD groups seemed to be at risk from this condition. The high external and low *RAI* indicates that one hardly possesses a feeling of ownership of the studies, which has been shown to be an important prerequisite of successful learning. The studies have shown that an early experience of not knowing the cause of success/failure, child's reported "unknown" source of control in kindergarten, is connected with later learned helplessness experiences and behavioral dysfunctions (Skinner, 1990). Thus, in order to intervene in order to development, identification of such tendency already at an early age could be useful.

While the other SEN groups acted more in order to gain incentives or avoid punishments and because of *introjected* pressure than out of *identified* and *intrinsic* reasons, the students, who had emotional and behavioral needs, seemed not to be under any pressure at all—neither from themselves nor others; however, the tendency of having significantly lower introjected scores was true only among EB-group boys. Because all the values of the self-regulation variables were under the whole sample's average (and all but identified under the absolute average of 2.5 on the scale 1-4)—this EB-type of self-regulation could be seen to be connected to *amotivaton*, which has been defined as a relative absence of self-regulation (Vallerand & Ratelle, 2003), or as a situation, in which values of all self-regulation variables remain substantially lower than average (Hayamizu, 1997; Ryan & al., 2000). It is said to be related to hopelessness and giving up of behaving (Ryan & al., 1995).

The lower the values are, the less self-regulation there is [of course one has to realize that the *amotivation* can target—not only the contents of the actual variables—but the questions and questionnaires, the context of study].

It appeared that school would not be able to “touch under the surface” in the EB group case, whilst in the LD and NO groups the school’s over nurturance seemed to have led merely to learned helplessness. A child also integrates and accepts outside goals, if they appear meaningful. Meaningfulness can be comprehended as finding the connection with one’s behavior to the outcomes, Vallerand and al. (2002) refer to this by saying that students should perceive the contingency between what they do and the consequences. This meaningfulness is mediated, if a child feels respected—the students of the EB classes might lack this feeling.

The results of this study cannot provide explanations, but more than a good guess could be that these students have lost trust in authority, adults sometime in their pasts, and as a consequence act only, if at all—as also this study hints—for external or intrinsic reasons. This implies that the relatedness with teachers or other authorities is not involved. The low *identified* value further indicates that they were not willing to internalize educational targets, those aims and goals set in the curriculum that the teachers try to mediate. This behavior is likely to lead to trouble at school. In the case of LD and NO it could be speculated that student in those groups have lost trust in the first place in themselves, and depend overwhelmingly on teachers and significant others.

[The SCIMA-class deviated from the other selected classes having a profile much resembling the EB-profile: overall low, peaking in external and in intrinsic. The characteristic for SCIMA was their lowest identified values. They seemed not have adjusted to school and had trouble accepting the school’s targets. However, as mentioned before, the results are based only on one class, they cannot be generalized and have, thus probably, only curiosity interest].

Although the LA and English groups students had high *external* and *introjected* values—in a manner similar to NO and LD (the latter only in external)—their situation could be assumed to be more favorable, because they also had high values in the other self-regulation variables. The profile of LA-group also differed most from others significantly being overall high. Should this overall high self-regulation be interpreted as an indication of a somewhat

undifferentiated experience of external and internal loci of control—or just as an indication of different usage of the scales¹⁴?

Prior results have shown that this differentiation should happen when children are around 9–10 year old (Skinner, 1990), and the students of the ENG group were on average younger than others (age mean 10.8 years). Are they in a period, in which they actually just are in the process of realizing what they want themselves or could this overall high self-regulation be more of a sign of mental flexibility? Anyway, age is involved in the English class result, because of already explained age/selective education interaction effect: younger age enhanced external self-regulation clearly more in selected than in general and special education. In the case of LA one could speculate that the reason of the undifferentiated style could be related to overall slower cognitive development.

Although the values of the English classes were overall quite high, the students were not very autonomous, *external* reasons and *introjected*—fear of shame—was an important behavior pusher. This introjected self-regulation style which was the more emphasized the younger a student in ENG-group was, has been shown to be connected with a ‘perseveration’ coping style and the performance orientation, in which the ultimate goal is to show ability, compete with others, and in which the students are dependent on the environment’s approval. It is somewhat confusing that in the same time the students have high *identified* (“enjoy school”) and *intrinsic* values. One has to note that when age was controlled, introjected remained the strongest style in ENG and the other styles levelled out—however, the RAI became as high as in the MUS-group.

In the Music classes students had a relatively autonomous academic regulation style—they had a significantly higher RAI (although negative, as well). However, it has to be realized that the effect was small, explaining only 1%. Being in the Music class was connected with the lowest external and the highest RAI, which indicates ‘accommodation’ and ‘negotiation’ coping styles, and task-orientation—which in turn has been discovered to be accompanied by deeper learning and achievement.

Clearly there were these two dimensions to be distinguished between: the quality (external, introjected...) and the quantity (amotivation and its counter part ‘supermotivation’). The quantity dimension is manifested in a situation in which a student had both high more extrinsic and more intrinsic styles motivation at the same time (or vice versa, both low). These empirical results,

¹⁴ For example some groups might prefer higher ends for the scale etc. On the other hand, in the SRQ-A measures there are reversed scales, too, so it might be justified to rule out this scale-preference reason .

thus, suggest theoretically a possible need of its own dimension in the self-determination continuum for the quantity (or intensity) of motivation, where the already used concept of ‘amotivation’ might be at one end, and ‘supermotivation’ at the other.

General, special, selective education was a significant factor in the factorial models on *external* (explaining 3% of the variance) and *introjected* (explaining only 1% of the variance); more specific educational group (8) was significant on all styles and RAI -but external- (explaining 2-3%). On *RAI*, the educational group (8) was the only significant factor. Age was a stronger factor than educational group especially in *external* and in *identified*. Gender’s role was minor; its main effect explained only 1% in *introjected* and *identified*.

Because the more specific educational group was a significant factor on most of the self-regulatory styles and RAI, the results are shown in condensed form in Figure 28, in which the significant mean differences [based on one-way Anova results, so the interaction effects or the effects of age and gender are no to be seen] between a specific educational group and all the others group are marked with lines. In addition to the names of the self-regulation styles, the corresponding processes (see self-determination continuum in the theory section) are presented. In addition, the theory based hypothesized connections to motivational orientations are shown in the figure 28.

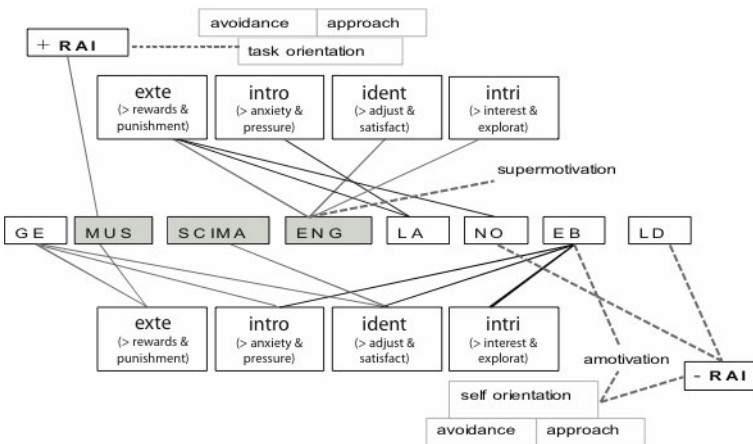


Figure 28. Self-regulation variables and related processes connected to educational groups (above: the means significantly higher, below: the means lower than in other groups).

H 11: Academic self-regulation has a correlation with school achievement: especially intrinsic self-regulation will be correlated positively with school achievement, and external self-regulation negatively.

The self-regulation variables correlated with GPA. As was hypothesized based on previous research (cf. the meta-research of Reeve, 2002; Miserandino, 1996; Flink, Boggiano, Main, Barret & Katz, 1992; Gottfried 1985; Wiest & al., 1998; Malberg & Little, 2002) the correlation was highest between intrinsic self-regulation and GPA, when only simple correlations were considered. External self-regulation had a small negative correlation with GPA, i.e. the higher the external self-regulation, the lower was GPA. This confirmed the hypothesis, but deviated from the Taiwanese results of d'Ailly (2003), who found that external self-regulation orientation predicted positively both effort and performance, and the autonomy experience had, in fact, a slight negative effect on school achievement. However, he pointed out that this contradictory finding probably relates to cultural differences: what children in the Western world perceive as control, might in this Asian context be interpreted as care and support.

As the study of simple correlations showed that there the strongest connection existed between the *intrinsic* variable and GPA, the picture was similar, when all self-regulation variables were regressed on GPA. The analyses were done separately in some of the independent participant groups, because of the found interaction effects. All in all, the connection between self-regulation and school performance was most important and connected with all self-regulation variables in selective education. In selective education intrinsic variable explained most, 6%, of the GPA variance, more than on third of a grade. It was the only self-regulation explainer in special needs education (4%) In general education intrinsic was a little less important than *external* (3%) which explained almost one third of a grade, and the effect was negative. The effects of external and *introjected* were somewhat higher in selected than in general education. *Identified* had an impact on achievement only in selected education. That style has been said to indicate school satisfaction, but against assumptions, it had a negative impact on school performance. A similar negative influence of identified self-regulation on academic performance has been reported by Wiest and al. (1998) in their study where they administered SRQ-A to junior and senior high school students. RAI explained 2-9% of the GPA variance.

Being in Special needs group meant almost a number decrease in GPA in the elementary level, and more than a number in the middle level; in the middle level being in selective education enhanced GPA by half a grade. Of the

special needs groups the being in LD had the strongest effect on achievement—it was connected to more than a grade decrease of GPA, and almost the same being in EB-group. Being in MUS was beneficial—one fifth of a grade more [SCIMA almost 4/5 of the grade more].

Intrinsic had an effect only in middle level (explaining 45 of the variance) and *external* in elementary level (2%). Being a girl was connected to a better performance in special needs and selective education (2-3% explanation rate).

To conclude:

According to the SDT-theory it is possible, to discover the more stable, general self-regulatory styles the students have—and those were on focus in this study. One has to note, however, that the ways of self-regulation (and accordingly motivation) are not fixed entities, and are both contextually and situationally bound—which makes them both vulnerable and on the other hand possible to intervene.

The high *external* was preferred especially among the younger age-groups and the special education group, and disregarded in the general education group. Introjected was characteristic for selective education (as a whole), and was especially disregarded in the EB groups. High *identified* was characteristic for the English classes¹⁵, LA-group and the younger groups, and low for the EB and SCIMA class. High *intrinsic self-regulation* related to selective education, and music groups to better relative autonomy than others.

In the light of this study, the self-regulation styles were most strongly connected with the children's development, i.e. they were age-related. In addition, the styles were differently connected to school levels: elementary and middle school—supporting the literature. However, also the type of class and to some extent gender in interaction with age or GEN/SEN/SEL were shown to affect the self-regulation styles. One has to note that even together these independent participant factors could only explain a limited amount of the self-regulation variation. This does not mean, however, that the present results would not be useful. Their value lies in the fact that they make the processes underlying a behavior more understandable and visible, which helps to plan school practices.

School environments shape students' self-regulation and motivational orientations: a warm emotional environment promotes task-orientation, intrinsic motivation, integration of outside goals, and the "perspective of hope". How-

¹⁵ in average little younger than other groups

ever, students also affect their environment and respond to contextual factors according to their personal history. Students' surface behaviors do not necessarily reveal the basis of their self-regulation or motivation. It is, thus, essential to study the underlying processes in order to prevent alienation from self. Instead of wasting energy in self-defence, it could be used in exploration of the world. Knowledge about complex self-regulation combinations can be useful in developing learning environments that support change of academic self-regulation from non-autonomous—or even from 'amotivation'—towards the more autonomous forms. This enhances the psychological well-being of students and supports learning—the ultimate goal of school.

6 The Prosocial Self-Regulation Study

6.1 Description of the SRQ-P

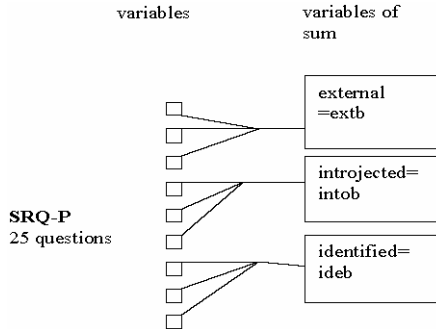


Figure 29. The SRQ-P and the variables of sum.

The Prosocial Self-Regulation Questionnaire SRQ-P (Ryan & Connell, 1989) is targeted to late elementary and middle school students in a prosocial domain. It consists of 25 multiple-choice questions (four alternatives: 1= not at all true, 2= not very true, 3= sort of true, 4= very true). For example, the students are asked for reasons why they do keep promises they make to their friends, or why they do not make fun of another students when they make mistakes. The questions correspond to the three self-regulation styles on the self-determination continuum, and they try to explore to which degree the students behave autonomously. The variables of sum are formed accordingly: external, introjected and identified. (Figure 29).

6.2 Results

6.2.1 Validity of the measure

In order to examine the structural validity of the measure, the intercorrelations and the data structure, and the hypothesis of self-regulation styles being structured as a continuum, were studied. The result was that the self-regulation variables formed a gradual continuum pattern (Table 21): the more

external variables correlated higher with each other and the more intrinsic variables correspondingly with each other.

Table 21. Correlations between the prosocial self-regulation variables

N=784		external	introjected
external	r		
	Sig. (2-tail)		
introjected	r	,61(**)	
	Sig. (2-tail)	,000	
identified	r	,30(**)	,69(**)
	Sig. (2-tail)	,000	,000

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

The reliabilities of the variables of sum were good showing sufficient internal consistency (Cronbach's alphas .71–.90; Table 3).

6.2.2 Descriptives of the prosocial self-regulation variables and comparison between the independent participant variables

The paired samples t-tests showed that in the whole sample the mean of identified was the highest, the second introjected and the lowest external. The means and standard deviations are shown on page 32 (Table 3). The paired samples test: external-introjected [$t(783) -19.25, p < .001$]; introjected-identified [$t(783) -26.45, p < .001$]; external-introjected [$t(783) -31.07, p < .001$].

Gender

Girls had significantly higher values in all three prosocial self-regulation variables; in external [$F(1,783) 4.65, p < .05$]; in introjected [$F(1,783) 27.64, p < .001$]; in identified [$F(1,783) 98.05, p < .001$]. (table 22)

Educational group (3)

The GEN, SEN and SEL differed significantly in introjected [$F(2,783) 7.85, p < .001$] and in identified [$F(2,783) 19.17, p < .001$]. The post hocs confirmed that there was a significant difference in both variables between special and selective education pro selective education. In identified the mean of special education was lower than both selective and general education. General education had a lower identified mean than selective education. (table 23)

Educational group (8)

When a more specific educational group was (for statistical descriptives, see table 33 in the Appendix) chosen as the independent variable, there was a difference in external [$F(7,783) 4.98, p<.001$], in introjected [$F(7,783) 11.02, p<.001$] and in identified [$F(7,783) 16.60, p<.001$]. The post hoc (Tukey) revealed that the EB-groups differed mostly from the others by having lower values in all three self-regulation variables (Table 24).

Elementary/middle school

When the sample was divided into two, elementary and middle school, the first one had significantly higher means in every variable: in external [$F(1,783) 17.06, p<.001$], in introjected [$F(1,783) 26.23, p<.001$], and in identified [$F(1,783) 32.57, p<.001$]. (table 25)

Table 22. Prosocial fulfillment variable descriptives by gender

gender		external	introjected	identified
Boy, n=440	Mean	2,57	2,89	3,25
	SD	,67	,63	,62
Girl, n=344	Mean	2,67	3,11	3,62
	SD	,62	,49	,38
Total N=784	Mean	2,61	2,99	3,41
	SD	,65	,58	,56

Table 23. Prosocial variable descriptives by educational group (3)

		external	introjected	identified
GEN, n=308	Mean	2,62	2,99	3,43
	SD	,62	,55	,51
SEN, n=284	Mean	2,63	2,91	3,27
	SD	,71	,66	,63
SEL, n=192	Mean	2,58	3,12	3,58
	SD	,62	,50	,46

Table 24. Posthoc comparisons of prosocial self-regulation variables between educational groups (8)

external	Means lower than in	Sig.
EB	GEN,LD,NO,LA,ENG	.001-.01
MUS	LA	.01
introjected		
EB	GEN,LD,NO,LA, MUS, ENG	.001
GEN	ENG	.05
identified		
EB	GEN, LD,NO,LA, MUS, ENG	.001
NO	MUS,ENG	.01-.05
LD	ENG	.05
GEN	ENG	.01
SCIMA	ENG,MUS,LA;GEN	.001-.05

Table 25. Prosocial variable descriptives by elementary/middle school

		external	introjected	identified
Element, n=509	Mean	2,68	3,07	3,49
	SD	,66	,56	,51
Middle, n=275	Mean	2,48	2,85	3,26
	SD	,62	,60	,61

6.2.3 Prosocial self-regulation profiles of the independent participant variables

In order to analyze the relative role of each self-regulation style in specific groups, the profile analysis was used. The prosocial self-regulation styles form a natural set so the prerequisite for using the MANOVA profile analysis was fulfilled (cf. Harter 1999; Nummenmaa & al., 1996).

Gender

The profiles were studied in a situation using age as a covariate. The test for parallelism confirmed the result of visual inspection (Figure 30): the profiles were non-parallel (Wilk's Lambda $F=21.28$ $p<.001$, $\eta^2= .05$). The profile of the boys was overall significantly ($p<.001$) lower than that of the girls. The gap was largest in introjected.

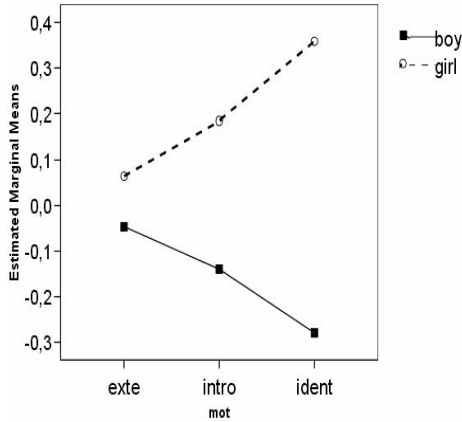


Figure 30. The self-regulation profiles of boys and girls (circle=girl, square=boy).

Educational group (3)

The profiles (age as a covariate) were found not to be parallel (Wilk’s Lambda $F=10.51, p<.001, \eta^2= .03$). The selective education profile was lowest in external, introjected was next and identified the highest. The SEN-profile was an opposite of that. The GEN-profile was overall flat (Figure 31).

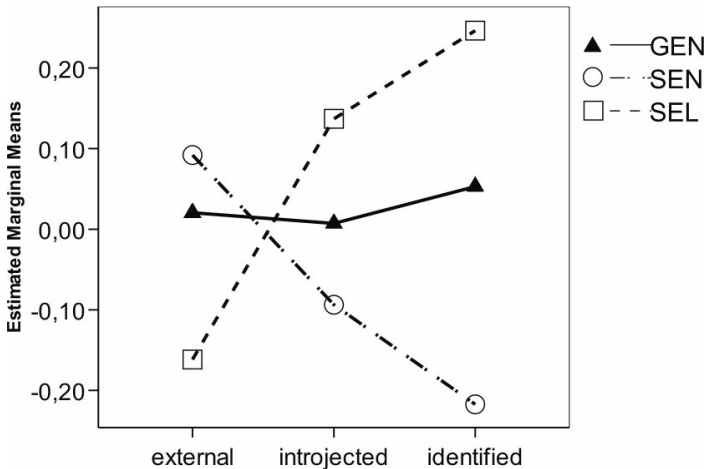


Figure 31. The SRQ-P self-regulation profiles of GEN/SEN/SEL groups (age as covariate) (square=SEL, triangle=GEN, circle=SEN)..

Educational group (8)

The self-regulation profiles (Figure 32) of the more specific educational groups were tested and found to be non-parallel (Wilk’s Lambda $F=4.83$, $p<.001$, $\eta^2=.04$). The profile shapes of special education groups NO, LD and LA were very similar, they deviated from the MUS and ENG shapes by having their emphases on external, whilst MUS and ENG stressed identified and introjected. EB-group was an exception by being overall the lowest. When the relations of the self-regulation variables were observed within the EB group, external was seen to be emphasized like in the other SEN-groups, as well.

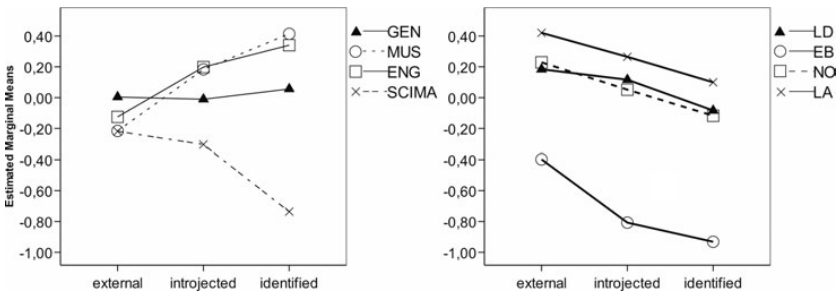


Figure 32. The self-regulation profiles of educational groups (SEL and GEN left, SEN right).

Age

Figure 33 shows the profiles of the elementary and middle level. The profiles were tested for parallelism and flatness and the profiles were found to be both parallel (elementary/middle $p=.437$) and flat, (elementary/middle $p=.929$) thus, they did not deviate in shape and within the group there was no variation between the test variables. They differed, however, by the level: elementary and middle school [$F(1,782) 72.28$, $p<.001$, $\eta^2=.05$]—the profile of elementary being significantly higher.

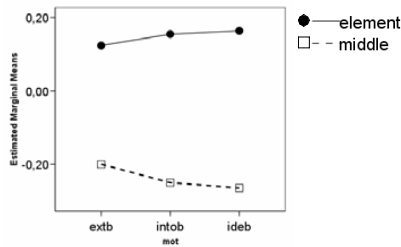


Figure 33. SRQ-P self-regulation profiles by age. Sig differences: elementary – middle.

6.2.4 The multi-factorial analysis of variance on academic self-regulation variables

The independent participant variables may have an effect on prosocial self-regulation styles when they are studied without any other factors. A more comprehensive picture emerges when factorial analysis of variance is used because then the relative impact of each factor in a model will be revealed. The five models presented in the procedures section were tested on each self-regulation style by factorial analysis of variance.

a) External

1. model: gender (2) x educational group (3) x age (continuous)

The final model revealed one significant effect on external prosocial self-regulation: a main effect of age [$F(1,780) 24.02, p < .001, \eta^2 = .03$]. Studying the effect revealed that the effect was negative: the younger a student, the higher the external.

2. model: gender (2) x educational group (8) x age (continuous)

In the second model an interaction effect of gender and educational group was significant [$F(7,780) 3.00, p < .01, \eta^2 = .03$] (Figure 34). The main effects of gender and age were non-significant.

Because of the interaction effect the analysis was carried on in split groups: the effect of gender was significant in GEN [$F(1,322) 5.37, p < .021, \eta^2 = .03$]: the GEN boys had significantly lower estimated means ($M=2.54, SD=.05$) than girls ($M=2.70, SD=.05$); the EB boys ($M=2.21, SD=.09$) than girls ($M=2.77, SD=.26$). The SCIMA boys and girls differed also, but because the group is so small, no conclusions can be drawn.

The girls' groups did not differ significantly. In the boys' group the effect of educational group was [$F(7,436) 5.65, p < .000, \eta^2 = .08$]. EB differed sig-

nificantly from GEN, LD, NO, LA and ENG. LA differed, in addition, from SCIMA and GEN.

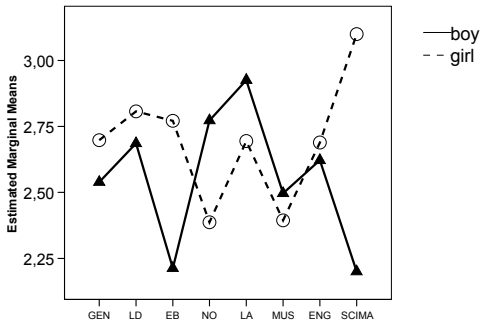


Figure 34. Prosocial external self-regulation plotted by ed.group (8) and gender (circle=girl, triangle=boy).

3. model: gender (2) x educational group (3) x elementary/middle (2)

Elementary/middle school has a main effect on external [F(1,783) 12.56, $p < .001$, $\eta^2 = .02$] and so has gender [F(1,783) 7.05, $p < .018$, $\eta^2 = .01$]. Gender and elementary/middle had an interaction effect [F(1,783) 6.87, $p = .009$, $\eta^2 = .01$].

Studying the separate groups revealed that in the middle level gender had an effect on external [F(1,274) 11.96, $p < .001$, $\eta^2 = .04$]. In the middle level boys ($M = 2.38$, $SD = .05$) had lower estimated means than girls ($M = 2.64$, $SD = .06$).

Boys in the middle level differed from boys of the elementary level in external [F(1,439) 21.77, $p < .001$, $\eta^2 = .05$]. Elementary boys had higher estimated means ($M = 2.68$, $SD = .04$) than middle level boys ($M = 2.38$, $SD = .05$).

b) Introjected

1. model: gender (2) x educational group (3) x age (continuous)

Age had a main effect [F(1,780) 26.88, $p < .001$, $\eta^2 = .03$]. The effect was pro younger age: the younger the children, the higher was introjected prosocial self-regulation.

2. model: gender (2) x educational group (8) x age (continuous)

A main effect of educational group appeared [F(7,780) 3.13, $p < .003$, $\eta^2 = .03$] and a main effect of gender [F(7,780) 16.72, $p < .001$, $\eta^2 = .02$]. The main effect of age was non-significant. Two interaction effects were found: educa-

tional group and age [$F(7,780) 2.86, p<.006, \eta^2=.03$] and gender and educational group [$F(7,780) 2.22, p<.05, \eta^2=.03$].

The simple analyses revealed that gender had an effect in general education [$F(1,322) 9.33, p<.002, \eta^2=.03$]: girls scored higher ($M=3.08, SD=.04$) than boys ($M=2.90, SD=.04$) and in LD-group [$F(1,63) 4.23, p<.044, \eta^2=.07$]: girls scored higher ($M=3.23, SD=.11$). (In SCIMA there was a similar effect of girls scoring higher). In general education age had a negative effect on introjected [$F(1,322) 5.48, p<.05, \eta^2=.02$], and so in LD, as well [$F(1,63) 11.89, p<.001, \eta^2=.11$].

The educational group had an effect on boys group [$F(7,436) 6.17, p<.000, \eta^2=.09$]. EB-boys differed from all the other but MUS and SCIMA by its lower introjected means (figure 35).

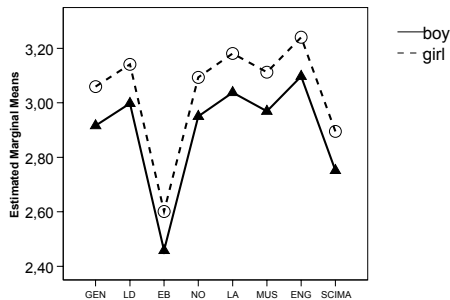


Figure 35. The interaction effect of gender and educational group (8) on introjected (circle=girl, triangle=boy).

3. model: gender (2) x educational group (3) x elementary/middle (2)

Elementary/middle school had a main effect on prosocial introjected self-regulation [$F(1,783) 20.02, p<.001, \eta^2=.03$], and gender had an effect, as well [$F(1,783) 29.65, p<.001, \eta^2=.04$]. There was an interaction effect of gender and educational group, as well [$F(1,783) 4.66, p<.05, \eta^2=.01$].

Because of the interaction effect the analysis was carried on in split groups: elementary/middle had an effect in boys group [$F(1,439) 21.97, p<.001, \eta^2=.05$]. Elementary boys (estimated $M=3.00, SD=.04$) scored higher than middle level boys ($M=2.72, SD=.05$).

Gender had an effect in the elementary level [$F(1,508) 8.22, p<.01, \eta^2=.02$]: elementary level girls scored higher ($M=3.14, SD=.04$) than boys ($M=3.00, SD=.03$). The effect of gender was stronger in the middle level:

[F(1,274) 20.81, $p < .001$, $\eta^2 = .07$]: middle level girls had higher estimated means ($M = 3.04$, $SD = .06$) than boys ($M = 2.72$, $SD = .05$).

c) Identified

1. model: gender (2) x educational group (3) x age (continuous)

The final model revealed a significant effect of age [F(1,780) 21.68, $p < .001$, $\eta^2 = .03$], and the younger students tended to score higher.

2. model: gender (2) x educational group (8) x age (continuous)

Two main effects were found: an effect of age [1,780) 5.59, $p < .05$, $\eta^2 = .01$] and a main effect of educational group [F(7,780) 3.66, $p < .001$, $\eta^2 = .03$]. One interaction effect was found: educational group and age [F(7,780) 2.71, $p < .001$, $\eta^2 = .02$]. The analysis continued by splitting the sample. The analysis revealed that age had a (positive) effect only in the exceptional SCIMA-group.

3. model: gender (2) x educational group (3) x elementary/middle (2)

Elementary/middle school had a main effect on prosocial identified self-regulation [F(1,783) 29.34, $p < .001$, $\eta^2 = .04$]. The estimated mean of elementary level ($M = 3.51$, $SD = .02$) was higher than the mean of middle level ($M = 3.30$, $SD = .03$). Gender had a main effect, as well [F(1,783) 94.47, $p < .001$, $\eta^2 = .11$]. Girls scored higher ($M = 3.58$, $SD = .03$) than boys. ($M = 3.22$, $SD = .03$).

6.2.5 Prosocial self-regulation variables and school achievement

The indicator of school performance was the great point average, GPA, which correlated somewhat with the prosocial self-regulation variables: GPA and introjected ($r = .15$, $p < .001$), GPA and identified ($r = .21$, $p < .001$). The correlation with external was non-significant..

The effects of the independent participant variables on GPA were tested by the following models: 1. gender (2) x educational group (3) x (continuous) age, and 2. gender (2) x educational group (8) x (continuous) age, and 3. gender (2) educational group (3) x elementary/middle school (2).

In the second model no interaction effects appeared. The analysis continued by using Linear regression analysis. The self-regulation variables were entered along with gender, age and educational group (8). The self-regulation variables identified and introjected were non-significant explainers (external was not entered because it did not correlate with GPA).

Because an interaction effect was found in the first model: between educational group (3) and age on GPA [F(2,739) 6.09, $p < .01$, $\eta^2 = .02$] and in the third model between educational group (3) and elementary/middle school [F(2,742) 11.38, $p < .003$, $\eta^2 = .02$] the simple regression analyses were carried out in the groups involved.

When the educational group was split, only in SEN prosocial variables had an effect: the effect of identified was significant. In that model it explained 4% of the GPA variance; age had a same size affect but a negative one. The explanation of the total model was $R^2 = .08$. In GEN age remained the only explainer by 1% explanation rate. In SEL none of the independent variables were significant. (Table 26)

Table 26. Significant GPA explainers in split GEN/SEN/SEL groups with prosocial self-regulation variables in the model in addition to gender and age

		B	Std. Error	Std.Beta	t	Sig.	Part corr.	Expl %
GEN	(Constant)	8.61	.29		30.05	.000		
	age	-.05	.02	-.12	-2.07	.040	-.12	1
SEN	(Constant)	6.12	.25		24.29	.000		
	age	-.09	.03	-.20	-3.49	.001	-.20	4
	identified	.27	.08	.21	3.55	.000	.21	4

When elementary/middle school was split, prosocial identified was significant in both models, in addition to gender and age. The elementary level model explained 11% of the GPA variance, middle level model 16%.. (Table 27)

Table 27. Significant GPA explainers in split elementary/middle level groups with prosocial self-regulation variables in the model in addition to gender and age

		B	Std. Error	Std.Beta	t	Sig.	Part corr.	Expl %
elemen	(Constant)	8.72	.45		19.29	.000		
	gender	.19	.08	.12	2.46	.014	.108	1
	age	-.17	.03	-.24	-5.34	.000	-.235	6
	identified	.21	.07	.13	2.84	.005	.125	2
middle	(Constant)	11.27	.95		11.88	.000		
	gender	.32	.13	.15	2.57	.011	.145	2
	age	-.36	.06	-.32	-5.58	.000	-.314	10
	identified	.36	.10	.21	3.54	.000	.199	4

Reliability of the regression analyses and diagnostics of the models

In all models the VIF- values were examined and they remained clearly under the critical value of ten: 1.00–1.15, and the tolerance values were .87–1.00, which indicated that multicollinearity would not make the model unstable.

In order to examine the regression analysis reliability, the datum was cross-validated by splitting it into two and conducting separate regression analyses. The analysis included the SRQ-P self-regulation variables introjected and identified, gender and age as independent variables and GPA as the dependent test variable. The explanation rates of the models were very similar ($R_{sq1}=.10$, $R_{sq2}=.11$). Almost the same standardized beta coefficients were significant in both models (model 1: age -.23, model 2: age -.21; model 1: gender .14, model 2: gender .12); introjected did not reach significance in either of the models, but identified was on-significant at the model 2 ($p=.061$), but significant in the model 1 ($p=.046$). The results showed that the conducted regression analyses on GPA were sufficiently reliable.

The case-wise diagnostics of all presented models showed that there were 0 to 10 cases with residuals more than 3 standard deviations apart from the predicted, which was not so much that it could have harmed the model fitting the data (cf. Muijs 2004).

6.3 Conclusions of the Prosocial self-regulation study

In the whole sample the *identified* was prominent (tested by paired samples t-tests), next came introjected and the last one was external. In identified the higher end of the scale was emphasized indicating the most unselfish self-regulation and empathy.

H 12: The prosocial self-regulation is structured as a continuum

The results confirmed the assumption that the prosocial self-regulation variables form a gradual continuum pattern. The *external* variable correlated higher with the *introjected* than with *identified*.

H 13: The prosocial self-regulatory styles do not vary with gender.

The null-hypothesis was rejected based on the one-way analysis of variance: Girls had significantly higher values for all three variables, which led to the overall higher profile of girls. The profiles were not parallel, and the gap was largest in *identified*.

However, the factorial analysis of variance enriched the picture: in the factorial models on *external*, gender had no main effect but an interaction effect with educational group. In general education and EB-education boys scored lower than girls and further analysis revealed that EB-boys differed from almost all groups by lower means; LA from some groups by higher. Boys in the elementary level scored higher than middle level boys.

On *introjected* the effect also showed to vary by gender: girls scored higher than boys in general education and in LD-group, and in the elementary level. Again EB-boys differed from the other boys by having lower estimated means than others (but MUS).

Gender's role on *identified* prosocial self-regulation was stronger than on any other variables (basic psychological needs fulfilment, academic self-regulation) of this study: at its strongest it explained 11% of the variance. Girls had higher identified estimated means than boys.

According to this study and based on the results of the prosocial variables, the overall conclusion is that girls have adjusted socially better, had internalized more unselfish moral values, and felt more empathy towards others than the special education group. On the other hand this prosocial behavior, social interaction, was mixed with internal pressure and anxiety. The fact that the girls show more prosocial behaviors than boys has been confirmed in prior foreign studies (cf. Eisenberg & al., 1995; Zimmer- Kemberck, Geiger & Crick, 2005) and Finnish studies (Pakaslahti & al., 2002; Junttila, Voeten, Kaukiainen & Vauras, 2006). The latter Finnish study showed that teachers and parents rated girls as more prosocial than boys, and so did the youngsters themselves. On the other hand it has been claimed that this is based on children's reports and general beliefs, but direct observation does not always support that view (Hay, 1994).

In the mentioned study only the prosocial dimension was studied, but the counterpart, antisocial, would have been an illuminating dimension. This point of view was applied in a recent Finnish study of children's social competence (Junttila & al., 2006). These results relate to findings of teasing and bullying which can be observed when the level of prosocial behavior is low or missing. Boys have been found to be more prone to this anti-social behavior (Barnett, Burns, Sanborn, Bartel & Wilds, 2004) which is a risk for future. However, constructive prosocial behavior and high self-control can be combined with aggressive behavior, and it has been shown to reduce the long-term negative effects of aggressivity, i.e. unemployment and marginalization (Kokko & Pulkkinen, 2000).

Moreover, when entering to deeper processes of self-regulation, it has been noticed that the success in relationships, thus also prosocial behavior,

can be affected of lower emotion threshold especially aggressive boys have claimed to have. They have shown to have greater reactivity to negative emotional experiences, for example to others' negative comments. (Dodge, 2006). This regulatory characteristic is genetic and biological but modifies through experience, as Izard and Kobak (2006) explain in their comprehensive model of regulatory systems. This modification aspect allows possibility and hints to interventions.

H 14: The prosocial self-regulatory do vary with age; the transition from elementary to middle school is an essential factor.

The hypothesis was confirmed. When the sample was divided into elementary and middle schools, the first one scored significantly higher in every variable. Although the values in the ninth it turned up again, this upturn did not reach the levels of elementary school.

The multi-factorial analysis of variance showed that on *external* age explained 2-4% of the variance. The effect of age (elementary/middle) was somewhat dependent on gender, having more impact among boys than girls.

In the case of *introjected* style there was a main effect: the younger a student, the higher the introjected. In an other model an interaction effect was revealed and studying it showed that this trend was to be found in general education and in LD-group; in LD group the effect was quite strong explaining 11% of the introjected variance. Boys in the elementary level scored higher than boys in the middle level. Overall age explained about the same amount of *introjected* variance as that of *external*.

The *identified* self-regulation style has already been explained to be most dependent on gender. Age affected it a little less than educational group (8). Overall younger age significantly promoted *identified* self-regulation (except in the small SCIMA-group).

The result that the younger age was connected to overall higher prosocial self-regulation seems to be inconsistent with the theoretical assumptions which would have indicated emphasis only on external prosocial self-regulation in younger groups (see page 18). Moreover, the finding that the relative role of *identified* self-regulation was not stronger than the more *external* among the older group is against the theoretical assumptions, too (cf. Eisenberg & al.,1995), although the results reported by Pakaslahti and al. (2002) did not support those expectations either.

H 15: The prosocial self-regulatory styles vary with educational group; especially students with emotional and behavioral needs have a less identified style than students without emotional and behavioral needs.

In the *external* style no significant difference between general, special and selective education was found—and that was the only variable of all basic needs, academic and prosocial self-regulation variables in which no difference between those groups was detected.

The multi-factorial analysis of variance further revealed that the more specific educational group (8) had on *external* an interaction effect with gender that explained 3% of the variance (explained in the gender-section).

The group of emotional and behavioral needs differed mostly from the others by having lower estimated means in introjected. This indicates that especially this group tends to disregard the social norms and does not seek social approval. Educational group (8) had the strongest effect in boys group in which it explained 9% of the introjected variance.

The one-way analysis of variance showed that selective education had in *identified* significantly higher means than special and general education. However, when other factors, gender and age, were influencing the situation, the effect of GEN/SEN/SEL disappeared. The profile shapes of special education groups were very similar by tending to lower towards more *intrinsic* direction. The group with emotional and behavioral needs was a significant exception by being overall the lowest—in this group *external* was also emphasized. In selective education the direction was the opposite: profiles got higher towards the more *intrinsic* direction (SCIMA being an exception).

The meta-analysis of social skills studies (Kavale & Forness, 1996) supports the findings; students with learning difficulties have social difficulties as well, and their social competence experience is especially vulnerable. The collected studies concerning social skills deficits showed that those students deviated more than two standard deviations from the students without LD. Further it has been shown that social intelligence correlates with learning skills (= language skills in that study), and those who have less social skills are more victimized and bullied (Kaukiainen & al., 2002).

To conclude: the hypothesis was confirmed in both parts. Because the more specific educational group was a significant factor on all self-regulatory styles, the results are shown in condensed form in Figure 36 in which the significant mean differences [based on one-way Anova results, so the interaction effects or the effects of age and gender are no to be seen] between a specific educational group and all the others group are marked with lines (above the higher means, below the lower). In addition to the names of the self-

regulation styles, the corresponding processes (see self-determination continuum in the theory section) are presented.

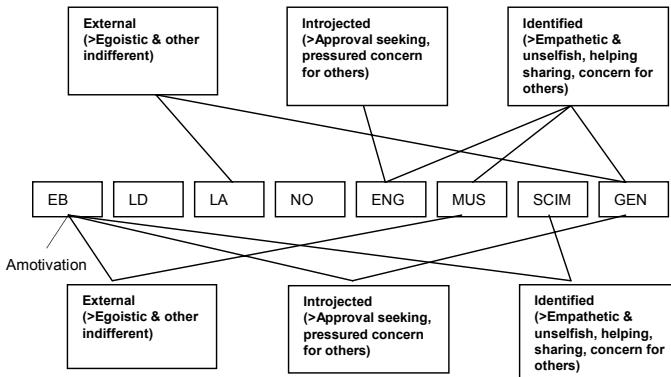


Figure 36. The significant connections between the educational groups and the prosocial variables and corresponding processes (above: means higher, below: means lower than in all the others group).

H 16: There is an association between prosocial self-regulation and school achievement.

The indicator of school performance was GPA, which correlated somewhat with *identified* and weakly with *introjected*, but not with *external*.

Because of the found interaction the educational group was split. The simple regression analyse revealed that of the prosocial variables only identified had an effect on GPA—and only in special needs education. That variable explained 4% of the variance. Further the analysis was carried out separately in the elementary and middle level. In the middle level identified explained a little more, 4%, compared to 2% in the elementary level. The effect of identified was the same or less than that of age, but more than gender’s.

Because there was some association between achievement and prosocial self-regulation, the hypothesis was rejected; although when previous literature findings were considered, the connection would have been assumed to be stronger (cf. Juvonen & al., 1996).

7 Connections Between Basic Psychological Needs Fulfilment, Academic and Prosocial Self-Regulation

The seventh question was how the basic psychological needs fulfilment, academic and prosocial variables were related to each other.

Academic self-regulation variables were found to correlate logically with corresponding prosocial variables (Table 28). Because they, however, correlated more within the domain (except that both external self-regulations correlated similarly with academic intrinsic), they formed distinct self-regulations, as expected.

Table 28 Correlations between academic and prosocial self-regulation

	Ac.extern.	Ac.introj.	Ac.identif.	Ac.intrins.	RAI
Pros.extern.	.59	.47	.33	.26	-.24
Pros.introj.	.49	.61	.52	.41	ns
Pros.identif.	.22	.39	.57	.41	.18

$p < .001$ in all

In line with the SDT-theory and confirming *the 17th hypothesis*: academic self-regulation correlated with the basic psychological needs fulfilment (Table 29). The more intrinsic self-regulation variables correlated most, and most with competence.

Table 29. Correlations between academic self-regulation and basic needs fulfilment variables

	Ac.extern.	Ac.introj.	Ac.identif.	Ac.intrins.	RAI
autonomy	ns	.09	.28	.30	.28
competence	ns	.14	.38	.41	.36
relatedness	ns	.09	.21	.23	.21

$p < .001$, except autonomy/introjected and relatedness/introjected $< .05$

The 18st hypothesis was confirmed: In the prosocial domain (Table 30) identified self-regulation correlated with relatedness need fulfilment—but similarly with the other needs fulfilment, although one would have expected the highest correlation to be with relatedness (cf. Ryan & al., 1989). Prosocial introjected correlated with the needs fulfilment, too, but with prosocial external self-regulation the correlations were non-significant.

Table 30. Correlations between prosocial self-regulation and basic needs fulfilment variables

	Pros.extern.	Pros.introj.	Pros..identf.
autonomy	ns	.21	.33
competence	ns	.23	.32
relatedness	ns	.27	.32

p<.001, except autonomy/introjected and relatedness/introjected <.05

In order to compare the combined variables, Figure 37 was constructed (age as a covariate). These profiles reveal the relationships self-regulation and basic psychological needs fulfilment have with each other, and their relative role in the profiles.

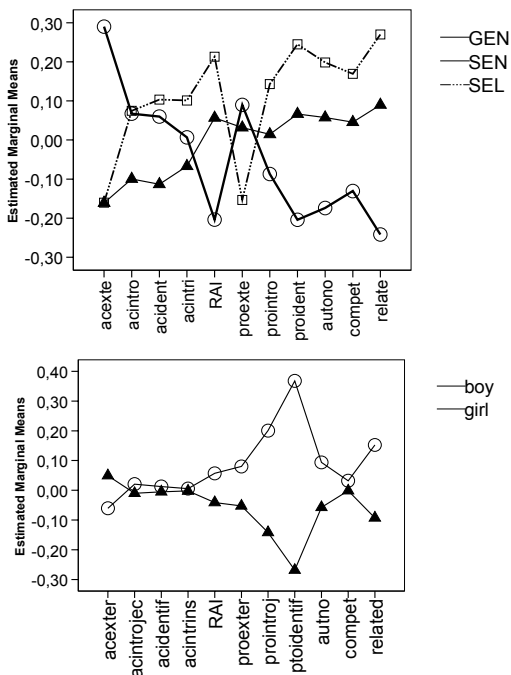


Figure 37. SRQ-A, SRQ-P and BPNS variables for the whole sample (above by GEN=triangle/SEL=square/SEN=circle, below by boys=triangle and girls=circle).

According to the profiles well-being is gathered in selective and general education; genders differ most in prosocial variables and relatedness; between

elementary and middle school profiles the gap is wider in academic self-regulation than in the other variables.

In addition to these traditional correlation comparisons, The Self-Organizing Maps method was firstly used for observing the connections between the variables, i.e. for confirmation of the just presented results of the seventh research question.

All the presented mean-comparisons by statistical descriptives and profiles in this study illuminate the differences and similarities between the independent participant groups in line with the original interest of this study. It was possible to spot the characteristics of the groups. However, in the course of the research process, the gathered cumulative knowledge led to a point in which this was simply not enough. One started to ask whether psychological well-being and self-regulation styles should not be observed the other way round. Via abductive reasoning I began to formulate a further hypothesis: in addition of studying the groups, one should do re-grouping. Maybe the special education classes had higher external or more external self-regulation on average—but what if the grouping was conducted using the self-regulation and basic psychological needs fulfilment variables as criteria—who would end up to what group? The Self-Organizing Maps method was secondly used for a person-oriented approach in grouping of observations (students), i.e. for answering the eighth question.

7.1 Self-regulation and psychological well-being in SOM-maps

7.1.1 Connections between the variables presented by SOM

Figure 38 shows the self-organizing maps. Several maps were tried in order to find a solution that was representative, as has been recommended (Kohonen, 1995; Kaski, 1997). The data were trained by all dependent variables, except that the relative autonomy index, RAI, was masked, because otherwise it would have been weighted too much in the process (this index is a result of a formula consisting of the academic self-regulation variables). Masking the variables means that they are shown in maps but they did not affect the iteration process. The independent participant variables (gender, type of education etc.) were masked as well.

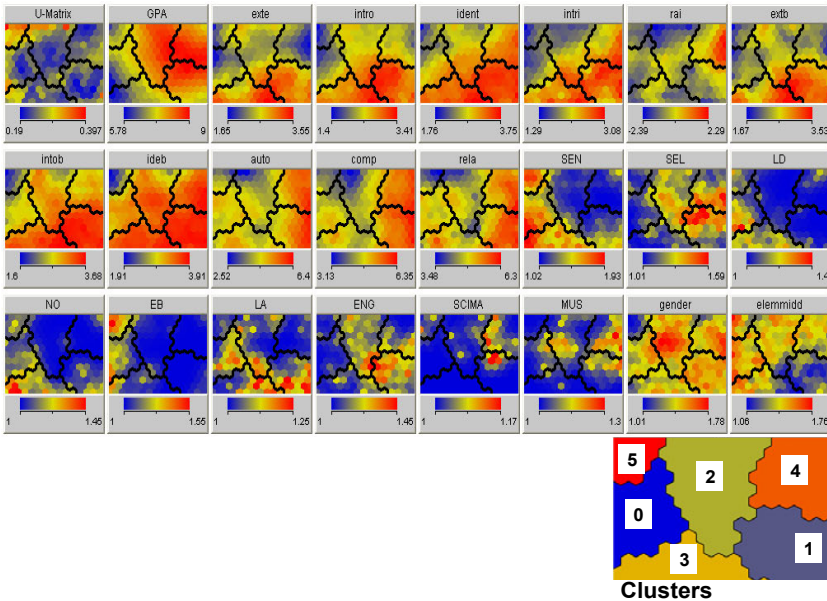


Figure 38. The well-being, self-regulation and achievement data shown by SOM-maps. (After the U-matrix the variables are in this order: GPA, academic external, introjected, identified, intrinsic, RAI; prosocial extb=external, intob=introjected, ideb=identified; autonomy, competence, relatedness; the independent variables are coded: SEN 1=others, 2=special needs; SEL 1=others, 2=selective education; LD 1=others, 2=learning difficulties and similarly also the other groups; gender 1=boy, 2=girl; elemidd 1=elementary, 2=middle school).

The U-matrix (the left corner in the first row) implies by the sufficient color variation that the data were suitable for SOM-analysis—the colors form noticeable separate fields. Each map presents one variable. The most intensive red color indicates the highest means in the variable in question; yellow indicates average and blue color low means (see the scale under each map). Where the same colors in separate maps are in the same area of the map, positive connection exists between the variables, if it is red/blue, it indicates a negative connection. Note that the same observations (students) are in all maps in the same place, and the colors reflect the scores they have in each variable.

Because the statistical analyses were conducted prior the SOM, it could be used for confirmatory purposes. The finding was that the self-organizing maps confirmed what had been observed by other means—but brought addi-

tional information along showing also non-linear correlations. The following are some of the main remarks:

1. The *self-regulation continuum* structure can be clearly identified by the logical ordered gradual change of colors. In the external self-regulation and RAI the blues and reds are in the opposite positions, and the others are in between.
2. The *best well-being* is overall situated as the best RAI, although not all students who experience subjective well-being, have a high RAI (=shown by the blue in the lower right corner of RAI, and in a same place by red in autonomy, competence and relatedness).
3. That the *academic self-regulation* is connected to *basic psychological needs fulfilment* confirms the 18th hypothesis of basic psychological needs fulfilment being connected to academic self-regulation, and partly answers the seventh research question concerning the relationship between academic and *prosocial self-regulation* (see, in addition, the correlation results p. 111–112).
4. The best *well-being* values also correspond with the best GPA¹⁶ (=all reds in basic needs variables are also red in GPA). However, not all good achievers experience subjective well-being (=blue or blue-yellowish color in basic needs, red in GPA). In this SOM shows its value: although other procedures, correlation and regression analysis, had spotted the linear connection between GPA and well-being, with SOM it was easy to see other non-linear tendencies, as well.
5. The 18st hypothesis: *relatedness* need fulfilment is connected to *prosocial identified*, can be seen to be supported by looking at the similar color patterns in the same areas in both maps: all good relatedness experience area is red also in prosocial map. However, there are exceptions, for example: in the second cluster there is a group in the cluster's upper left corner that clearly experiences low *relatedness* (=blue), but average identified (=orange) (see, in addition, p.111–112).
6. The dichotomous educational group variables confirm earlier results, for example, of the supermotivated students coming mainly from LA, ENG- and also LD-groups—situated in the first but also third cluster (LA-group is shown by red and yellow in the LA-map, similarly ENG

¹⁶ In SOM analysis the worded grades of younger students were transformed into numbers (excellent=9, good= 8, satisfactory=7, acceptable=6, needs practice/poor=5).

in ENG-map and LD in LD-map)—the highest self-regulation values are situated in the same places. That the RAI in those places is rather low confirms the theory: too much more *external* self-regulation in relation to a smaller amount more *intrinsic* leads to low relative autonomy experience.

7. Special education (in SEN-map the red and yellow areas) largely follows the lower-achieving area (=yellow and blue in GPA map).

Moreover, the maps show, for example, that intrinsic motivation or competence was not necessarily connected with high GPA, as could be hypothesized (Figure 39).

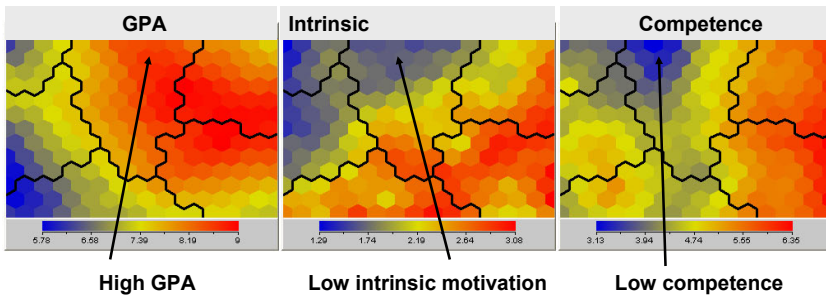


Figure 39. The relationship between intrinsic motivation, competence and achievement.

The trend was that high academic and prosocial external self-regulations were related to average or low achievement (cluster 3) with the exception of some groups in cluster 1 who had both high achievement and external self-regulation (Figure 40).

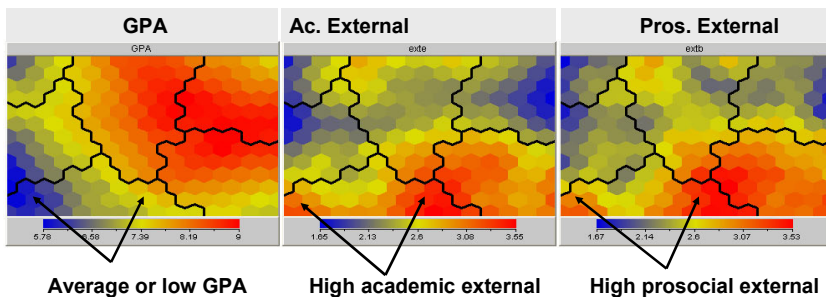


Figure 40. The relationship between external self-regulation and achievement.

Overall relative autonomy experience in this sample was quite low which can be seen by the small area of red and presence of large blue and blue-yellowish areas in the RAI-map (Figure 41).

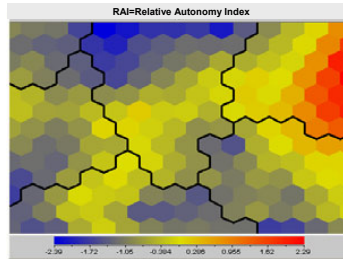


Figure 41. Relative autonomy experience (RAI).

7.1.2. SOM-identified sub-groups

Because the data were trained by the mentioned variables the clusters were formed accordingly, each thus include observations (students) that had the most similar mean patterns of psychological well-being, self-regulation styles and achievement.

After observing the maps and considering the number of clusters, the six-cluster solution was used. Several six-cluster solutions were observed. The cluster sizes and the amount of cases in each cluster varied somewhat (due the nature of SOM). Despite there being some variation, the essential characteristics remained the same, as the theory claims (Kohonen, 1995).

The six clusters that are explained next are numbered in the SOM maps (Figure 38) in order to help the reader to spot them in the maps. Those clusters correspond to the cluster graphs shown after explanation of the clusters in Figure 42. After the clusters were formed by SOM, the mean differences of basic psychological needs fulfilment and self-regulation variables were tested by ANOVA in SPSS (see tables 34,35, in the Appendix).

Examination of the clusters revealed that good school achievement could rely on a healthy or less healthy basis as the graphs of the 2- and 4-clusters show (Figure 43). The significance of the independent participant groups emphasizing certain clusters is based in the following on the observation of the adjusted standardized residuals and Chi square tests (see Table 31).

Table 31. The independent participant variables in relation to the SOM-clusters (adjusted standardized residuals; residual ≥ 2 sig.)

	0 cluster	1 cluster	2 cluster	3 cluster	4 cluster	5 cluster	Chi sq	Sig
girls	-1.1	1.9	2.6	-1.4	.7	-5.1	35.57	.000
boys	1.1	-1.9	-2.6	1.4	-.7	5.1		
elementary	-4.2	5.0	-.5	.7	-.6	-1.8	38.56	.000
middle	4.2	-5.0	.5	-.7	.6	1.8		
GEN	-2.8	.3	4.0	-4.8	4.9	-3.4	184.60	.000
SEN	6.2	-3.1	-5.7	7.7	-6.9	4.9		
SEL	-4.0	3.3	2.0	-3.3	2.3	-1.8		
LD	3.8	-3.0	-3.4	4.6	-2.2	1.8	267.24	.000
EB	3.8	-3.5	-2.4	1.1	-3.1	7.6		
NO	3.2	-.6	-4.0	4.6	-2.7	.3		
LA	.4	2.0	.3	1.0	-2.8	-1.7		
MUS	-3.5	3.9	1.6	-1.5	-.4	-1.3		
ENG	-.9	.5	1.1	-2.4	2.7	-1.8		
SCIMA*	-1.7	-.3	.2	-1.8	2.9	1.1		
All Basic needs M< 4	-2.9	-4.8	6.5	-.8	-4.5	9.3	153.51	.000
The others	2.9	4.8	-6.5	.8	4.5	-9.3		
N 743								

*In the case of SCIMA there are columns with minimum expected count <5

The 0-cluster (n=111) was connected to a lower than average achievement and also to low self-regulation values. Especially academic identified which indicates school adjustment and enjoyment of school, and prosocial identified indicating positive other-oriented behavior, empathy, were the second lowest. Academic intrinsic and introjected were even on the absolute scale under the average of 2.5 (scale 1-4) being with the fifth cluster students significantly lower than the others. The basic psychological needs values were, however, only a little under average. Based on those findings this group was called *School-dissatisfied*. This cluster was emphasized by middle level students and special education: 1/4 of the special education group belonged in this cluster—over 30% of LD and EB. Only LA-group students were not represented more than expected. Especially ENG-group was underrepresented here.

The 1-cluster (n =165) *Supermotivated* was overemphasized by younger, elementary level students, especially LA- and ENG-students and somewhat girls (std. res. 1.9). EB-and LD-students were represented less than expected.

This was a cluster that was mixed between special and selective education. That the “supermotivation” is not connected to the best academic outcomes was shown by this cluster, which had either the highest means or shared the first place with some other cluster in all dependent variables but GPA which, however, was above the average. In this cluster boys scored significantly higher in competence ($M=5.79$, $SD=.65$) than girls ($M=5.58$, $SD=.65$) [$F(1,164) 4.18$, $p<.05$][—]in achievement no gender difference was found.

The 2-cluster ($n=170$) *Unhappy performers* was the second highest achieving, but except the school achievement, all basic psychological needs fulfilment variables were under average—in fact the autonomy and competence needs and RAI were significantly lower than in others but the fifth cluster which was overall the most lowest scoring of all. In intrinsic and both academic and prosocial identified this cluster was the second lowest. In relatedness this group scored significantly lower than the others, but higher than the fifth. These findings indicate poor well-being and adjustment. Even the absolute scores were low in autonomy (4 in scale of 1-7) and academic intrinsic self-regulation (2 in scale of 1-4). This was another general/selective education cluster, and about 30% of selective and general education students belonged here. — but only 12% of special education students. Particularly they were only a few LD- and NO-group students. There were clearly many more girls and less boys in this cluster than would have been expected.

Two different self-regulation & basic psychological needs fulfilment combinations were connected to the two poorest achievement clusters. The 3-cluster ($n=125$) was called *Motivated low-achievers*. This cluster greatly resembles the 1-cluster *Supermotivated*, although the motivation level was slightly lower, the difference was significant only in prosocial identified. However, those two clusters differed in the academic outcomes: this 3-cluster shared the lowest GPA (6.8) with the fifth cluster—the *Supermotivated* had a GPA of 8.1. They also differed in the basic psychological needs satisfaction: the third cluster had significantly lower means, although just a little under average. So—the low achievement was here connected to reasonably well-fulfilled psychological needs. There were two clusters in which boys and girls differed in GPA. In this cluster the achievement of girls was higher ($M=7.0$, $SD=.55$), boys ($M=6.7$, $SD=.61$). This was the other clear special needs cluster: 30% of these students belonged in this cluster, and less than 10% of general or selective education. Particularly this was a cluster of LD- and NO-students—and not a cluster of music class students.

The 4-cluster ($n =126$) This group was called *Happily successful*. It had the significantly highest GPA and also higher basic psychological needs fulfilment scores than any other group but the cluster one. As the only cluster, it

had a positive relative autonomy index, RAI, which shows that students in this cluster experience themselves autonomous and feel responsibility for their own work. In academic and prosocial external and academic introjected the scores were under the absolute average of 2.5 (scale 1-4). In the prosocial identified self-regulation—which indicates unselfish, empathetic behavior—only one cluster scored significantly higher. Further examination revealed that girls scored significantly higher in prosocial identified self-regulation (same tendency in all clusters) and autonomy. In both academic and prosocial more external self-regulations this cluster scored under the average. This cluster was a general and selective education cluster (1/4 of the students were from those educational groups)—and especially not a special needs cluster (only 1/20 of special education students were here). Especially the group with emotional and behavioral needs was underrepresented here.

The 5-cluster (n=46) *Amotivated low-achievers* shared the lowest school achievement status with the third cluster. This smallest cluster was related to overall lowest self-regulation, especially academic introjected and intrinsic and all prosocial variables. In addition that the means were relatively low, all means were below the absolute average of 2.5 (scale 1-4). Because of that one can consider students of this cluster as amotivated. A somewhat contradictory result seems to be that the relative autonomy index was not significantly lower but only between the fourth *Happily successful*-cluster. The average basic needs fulfilment was among the lowest, too, although in autonomy and competence the difference was non-significant with the second *Unhappy performers*-cluster. On the 1–7 scale autonomy and competence remained under the absolute average of 4. This was clearly a gendered cluster: cluster of boys, somewhat of middle level (std. res. 1.8) and special education—especially students with emotional and behavioral needs (28% of them were here).

The cluster profiles based on standardized cluster means are shown in the next figure.

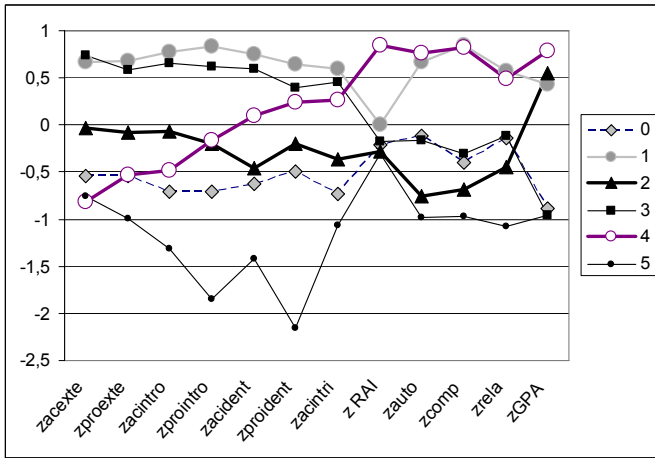


Figure 42. Profiles obtained according to the standardized scores of 6 SOM-clusters (The approximate measure of significance is difference $>.30$, in GPA $>.24$).

The representation of the independent participant groups in relation to the SOM clusters is summed up in the next percentage Table 32. The table can be read from two directions, horizontally and vertically. Each row shows the within percentages of a independent participant group in each cluster. The column percentages can be compared with the expected percentage presented below. If one observes the *Happily successful* column, the percentages can be compared with the “Expected % within cluster” (underneath); for example SEN is very much underrepresented in that cluster by its value of 5% compared to an expected value of 17%.

If one observes the rows, it reveals the within independent participant group’s percentage in each cluster; for example the first row shows that girls are more represented in 1., 2. and 4. cluster than in 0., 3. and 5. The table shows that even though the independent participant groups are mixed in the clusters there are clearly clusters which are more crowded by students with special needs (0, 3,5), EB (0,5) and LD and NO (0,3), LA (1), selective education (1,2,4), MUS (4) and ENG (1), SCIMA (4), boys (5), girls (2), middle school (0), elementary (1) (cf. the clusters in SOM-maps).

Table 32. Percentages within independent participant group in cluster (the shadowed cell indicates smaller percentage than expected, the parentheses=ns.)

	0.cluster School dissatisfied n=111	1.cluster Supermotivated n=165	2.cluster Unhappy performers n=170	3.cluster Motivated low- achievers n=125	4. cluster Happily successful n=46	5. cluster Amotivated low- achievers	Within total % N=743
Girls n=316	(13)	(26)	28	(15)	(18)	1	100
Boys n=427	(16)	(20)	19	(19)	(16)	10	100
Element n=466	11	28	(22)	(18)	(16)	(5)	100
Middle n=277	22	12	(24)	(16)	(18)	(8)	100
GEN n=304	11	(23)	30	9	25	3	100
SEN n=279	25	16	12	31	5	12	100
SEL n=160	5	32	29	8	23	(3)	100
LD n=60	32	7	5	38	7	(12)	100
EB n=64	31	5	11	(22)	3	28	100
NO n=72	28	(19)	4	36	6	(7)	100
LA n=66	(17)	32	(24)	(21)	5	(2)	100
MUS n=48	(10)	(25)	(29)	4	31	(0)	100
ENG n=96	3	38	(29)	(12)	(16)	(3)	100
SCIMA n=16	(0)	(19)	(25)	(0)	44	(13)	100
Expected % within cluster	15	22	23	17	17	6	100

8 Discussion

Motivation starts behavior that becomes guided by self-regulation. The perceived locus of control (PLOC)¹⁷ effects how self-determined this behavior will be, in other words, in which degree autonomously regulated. When the prior school motivation research has largely handled motivation from a dichotomous extrinsic/intrinsic point of view it has missed the gradual aspect of motivation and corresponding self-regulation that makes more understandable the mechanisms of integrative processes and connections between self-regulation and behavioral orientations. This point of view clarifies why it is important to support students towards actualizing their intrinsic motives, but as essential to try to organize environments that foster integration. Integration is a part of adjustment in existing conditions, and it means that students accept targets that are considered to be beneficial for their development. In order to be able to accept external goals, a student has to feel emotionally safe, have sufficient ego-flexibility—which builds on satisfied psychological needs. In this study those conditions were explored.

8.1 Main impact of this study, answers to the research questions and implications of the students' experiences

The main impact and value of this research results from the possibility to look at the psychological well-being and self-regulation at school from two different angles. The variable- and person-oriented approaches made possible to observe the situation in a way both from inside out and outside in (compare Figures 42 and 37 & Table 32). If we had used only variable-oriented analysis, the picture would have become too general: both ends of the student selection would have been described through the group averages. However, the person-oriented approach brought new evidence: not all good is gathered in selective classes, and vice versa: not all disadvantages in special education groups. This evidence adds knowledge and refines the well-being and self-regulation picture, and may re-direct intervention plans, and turn our focus also on students who might otherwise remain unnoticed. On the other hand,

¹⁷ Although there is some disagreement in the literature whether to use the *PLOC*, perceived locus of control conceptualization, or rather *forced-choice* (Skinner, 1990), in this study this differentiation has considered not be important.

these results imply simultaneously that in special education groups the average is not the whole truth.

Psychological well-being, autonomous self-regulation and corresponding motivation lead to overall self-determination according to the SDT-theory. Self-determination has shown to be crucial for quality of life. Low levels of self-determination is related to drop-out and less adult success. Especially this is so when students have special needs. On the other hand, enhancing self-determination is an effective way to improve future educational prospects and life expectancies. (cf. Eisenman, 2007, Lachapelle & al., 2005). It has even been noticed that self-determination and competence experience predict intentions to stay in school more than academic achievement (Hardre & Reeve, 2003; Eisenman, 2007). Thus the present study handled essential quality elements of education and focused particularly on groups which would benefit of right kinds of interventions. Because the independent participant groups showed to have different basic needs fulfilment and self-regulation profiles it seems justified to conclude that the design of this empirical study was relevant.

The research questions asked about differences between the participant variables of gender, age and educational group in relation to basic psychological needs and self-regulatory variables. The results showed that gender was relatively the weakest factor of the independent variables on all other dependent variables but identified prosocial variable on which the effect was the largest. Age had the largest main effect of the independent variables on academic and prosocial external variables and academic identified. Theoretically identified regulation has shown to be connected to accommodation coping style. External regulation has shown to have a relationship with avoidance orientation and with coping styles of opposition, denial and projective coping. (Skinner & al 2002). Educational group was the strongest factor on basic needs fulfilment and gender on prosocial identified variable. In addition to main effects, various interaction effects were found. It shows that it is important to use methods which can reveal those effects.

The research questions further asked how school achievement was related to basic needs fulfilment and self-regulation. The results showed that in the case of the basic needs, competence need fulfilment was the strongest factor on the GPA, then autonomy and the smallest relatedness. Of the academic self-regulation variables intrinsic was the strongest factor, then external which had a negative effect on achievement, then introjected, but identified had an effect only in selective education, and it was a negative one. Externally regulated students are likely to engage in things superficially, because their goal is to do what they are told—in order to survive, gain good grades

or to avoid sanctions. Introjected regulation has been shown to have a relationship with performance goal orientation and to be connected to perseverance coping style; intrinsic to mastery orientation and coping styles of negation and effort. (Skinner & al 2002). Why identified regulation was in selective education connected to poorer performance remains unexplained. This style is said to indicate school adjustment, acceptance of outside power and willingness to cooperate—which logically should promote deeper engagement and along wit that better performance. Prosocial identified variable had a small impact on achievement in the elementary level and a little stronger in the middle level. In special needs education one point more in identified increased GPA more than one fourth of a grade.

The last questions asked how the studied variables were related to each other and what kind of subgroups could be identified. The results showed that the correlations between the variables were overall logical thus supporting the hypotheses. By the SOM-method six subgroups were identified, and they showed to have significant differences in basic psychological needs fulfilment, self-regulation and achievement. Although the clusters were in a large extent confirming what was noticed by using comparison of the variables: the SEN groups had lower levels of basic needs fulfilment and less autonomous self-regulation variables (=self-determination), interesting deviations of that rule appeared. Some of the SEL- and GEN-group members ended up in the more unfavorable clusters, and not all SEN-group members belonged to the poorest clusters (although majority not to the best either).

The conclusions of the results are discussed next. Because of the complexity of the connections, it must be understood that all the interpretations only show hints of tendencies and directions—they by no means claim to reveal absolute truths.

8.1.1 Continuum confirmed, and self-regulation and well-being correlate

In this study self-regulation formed a continuum as hypothesized according to the SDT-theory both in the academic and prosocial domain.

Academic self-regulation variables showed to correlate moderately with corresponding prosocial variables. Because they, however, correlated more within the domain (except both external variables correlated similarly wit academic intrinsic), they were shown to form distinct self-regulations, as expected. In line with the SDT-theory and confirming the hypothesis: academic self-regulation correlated with the basic psychological needs fulfilment. The

more intrinsic self-regulation variables correlated most with competence. In the prosocial domain identified self-regulation correlated with relatedness which was assumed—but equally with the other needs, although one would have expected the highest correlation to be with relatedness (cf. Ryan & al., 1989).

8.1.2 Majority are happy and motivated, but still non-autonomous

The school related psychological well-being of most students was good in respect to all three needs: in the absolute scale of 1–7, the mean was over 4. The good news is shadowed by the fact that for 11% of the students all three psychological needs fulfilment was threatened. When applied in everyday school life, this result means poor well-being for 2-4 students in a class of 25. Boys were more in risk (14%) than girls (9%). The percentages of boys (but not girls) varied by educational group (general 13/special 16/selective 10)—the special education percentage consisting mainly of EB- and less so of LD-groups. The picture changes to more complicated if one considers the fulfilment of each need separately. According to the theory all the psychological needs should be fulfilled, and one has to note that when the fulfilment of separate needs was examined 12-19% remained unfulfilled.

The self-regulation results showed that overall the students were both academically and prosocially motivated, the absolute means were over 2.5 in the 1 to 4 Likert scale. Because the relative autonomy experience remained negative, the PLOC, thus, was more external than internal. This implies that the students act rather because they want to gain rewards or approval, or in order to avoid sanctions and pressure, than because they consider the behaviors important or enjoy them.

8.1.3 LD and EB overrepresented in the “Amotivated low-achievers”—but luckily not the whole truth

Studying the SOM-maps and cluster graphs showed that when the self-regulation and basic need variables are examined together, there exist diverse more or less favorable patterns. Moreover, the grouping made by SOM confirmed the results of some independent participant groups being more deprived/more fortunate than others because they were emphasized in more disadvantaged/advantageous SOM clusters, as well. Thus, by SOM clustering

essential perspective was gained which was enriching the picture obtained by the variable oriented approach. In fact, the picture even changed somewhat.

The analysis of group means pointed out that well-being was significantly more threatened among the students with emotional and behavioral needs and (less so) in the group of learning difficulties getting part-time special education. In the groups with emotional and behavioral needs almost one third of students and in the groups with learning difficulties every seventh student had a poor subjective well-being experience. One has to add, however, two important remarks: 1. These results simultaneously imply that two thirds of EB-students and six out of seven LD-students *did* have a good well-being experience, and 2. When observing these average tendencies, it might too easily remain unnoticed, or not comprehended that for some special education students having severe life-experiences school anyhow offers the only stability and safety they have. Although well-being is threatened, *at school* the situation might be the best possible (an example of one of those students was an elementary school boy in EB-class, who added one more item into the questionnaire: “Do you think that school is a safe place?”, and circled the ‘very true’ alternative himself).

The SOM-cluster approach confirmed that especially EB students were overrepresented in the cluster *Amotivated low-achievers* having lowest means in self-regulation, well-being and achievement, as well (almost 30% of EB, and 12% of LD). In that cluster the students were further found to be more boys than girls.

The *amotivation* reached also prosocial domain, and plus introjected self-regulation also identified self-regulation was poor. The low academic identified implies problems in adjustment and in the integrative processes. Translated into practical language this means that those students are not willing to do what they are expected, do not accept orders, and try to avoid tasks they are given as much as they can. The low prosocial identified, in turn, indicates that these students tend not to be concerned with the welfare of others. Both low identified self-regulation styles of these two domains are related to relationship with people, and are probably rooted to a long-time deprivation of the student’s needs. In the light of the literature (Ryan & al., 2005), this can be seen to be linked with “rely on no one”-behavior, and probably unsafe attachment (cf. Booth-LaForce & al., 2005). These emotional non-reliance and integration problems can be thought as forming an untouchable surface which bounces back even the most good-willing trials—an unfortunate surface considering learning.

In order to understand the possible constitutes of amotivation, it might be useful to look at the situation through a model by Cheyne and Tarulli (1999)

which aims to compare the Vygotskian and Bakhtinian views and impact on dialogue in educational context. In short they use the concepts of ‘first’, ‘second’ and ‘third voice’ of Bakhtin to represent the parent/teacher, child/student and authoritative institutional party (e.g. curriculum). They claim that also in Vygotsky’s conceptual frame of Zone of Proximal Development (ZPD) there is implicitly a ‘third voice’ in-built, in addition to the first and second.

In an unproblematic world the second voice interprets the ‘message’ of the third voice and utters it to the second voice. The second voice, the student, accepts what is to be accepted because he/she sees the gain of enculturation that is targeted. However, complications emerge if the second voice begins to have more space (e.g. due to weakening first voice) and the hierarchical structure of the (Magistral) dialogue moves towards a more open (Socratic) dialogue. In the extreme the dialogue may become unmanageable (Menippean), because the first voice cannot anymore control the unpredictable situation. The authority of the first voice, i.e. the parents or teachers, can be in jeopardy in two ways according to Cheyne and Tarulli (1999): 1. the adults fail to “live up to their own standards”, or 2. are “misguided by false standards”. In the present study, thus, both of those could be in part explaining why the basic needs fulfilment of some students is threatened and those students are unwilling to integration and unable to adjust.

School surely faces here a much bigger challenge than in the supermotivation case: how to turn avoidance to approach. When all the basic psychological needs are unfulfilled, all of them have to be of concern.

8.1.4 Special needs almost missing in “Happily successful”

The hypothesis of competence need fulfilment being critical for LD group became confirmed, although the effect was small. The reason for it can be speculated to be in that their learning difficulties become more prevalent in a learning environment where only a few students have special needs. LD-students have been found to have a more negative global self-image than others without LD in inclusive settings, but when LD-students are in a special class there are no differences in the self-image compared to non-LD students (Montgomery, 1994). Moreover: the LD-students are most likely included in the 15–20% of the general education students who have shown (Hautamäki, 2002) to achieve results similar to the students in special classes or even to those 6% who perform less than students in special classes. Then it is no wonder that they often have to struggle with school tasks, and encounter

threats to their experience of competence.—On the other hand, although the other group of learning needs, NO in segregated settings, did have higher competence scores, and were less represented in the poorest SOM-cluster, only four NO-students out of 72 were represented in the *Happily successful* -cluster.—These results concretely show how complex the connections are—and warn us not to over-generalize and draw too hasty conclusions.

The good fulfilment of the needs, especially competence need, in the LA group was speculated to be rooted in the individually adjusted academic evaluation which is stated in the individual learning plan (ILP=HOJKS), and which is not other-referential, as in the other special needs groups which follow the general education curriculum plan. The analysis of the clusters confirmed that the group with lower academic standards did not follow the pattern of LD and EB emphasizing the poorest clusters—but rather the *Supermotivated*, over thirty percent of them belonged to that cluster. On the other hand, in the most favorable clusters LA students were not more represented than the other special needs groups.

8.1.5 Supermotivation—undifferentiated motivation and self-regulation related to negative RAI

That not only the style of self-regulation is important became evident in the *Supermotivation* cluster which was connected to a slightly better than average achievement and in which all kinds of self-regulations were preferred simultaneously—the consequence of this combination was that the RAI remained negative. This implies that their self-regulation was a mixture consisting, in addition of enjoyment and acceptance of tasks and school, experiences of pressure, anxiety, and behavior conditioned to rewards and punishments. Simultaneously the orientations can be presumed to vary between task/performance/self/avoidance orientations. The same tendencies existed both in academic and prosocial domains. This means according to SDT-theory that the behavior was not self-determined, the PLOC was outside of self, and as the result the performance was not comprehended as an outcome of one's own action. It, thus, did not lead to an agency experience; feeling of ownership of learning that could have resulted in a higher effort, better learning strategies and achievement.

These “supermotivated” students were from the LA and ENG groups — but very few from EB and LD. Because they also were clearly more often from the elementary level, this self-regulation style could be seen to be combined with development reflecting the tendency of a psychological state first

being more global, and then tending to become increasingly more differentiated (Werner 1957; cf. Skinner, 1990). Thus the found “supermotivation” might be explained, at least partly, by a more global PLOC relating particularly both to younger age, and to presumed delayed cognitive development in LA. If the explanation of “supermotivation” is true, this style can be assumed to be likely to change into a more differentiated style with age.

8.1.6 The most favorable cluster overrepresented by selective and general education students—but also “Unhappy performers”

The results clearly confirm the theoretical hypotheses and prior results: the most favorable self-regulation/well-being pattern (high RAI, high basic needs fulfilment) logically was connected to the best performance, as well. Students in this *Happily successful* cluster can be claimed to have ownership of their learning. A total of 23% of selective education and 25% of general education students—but only 5% of special education students belonged to this fortunate cluster. (Black bars in Figure 43).

However analyzing the SOM-clusters revealed that not only in special education but also in general and even in the overall, in all variables, outperforming selective education, there are unfavorable self-regulation tendencies and deprivation of psychological needs which could be spotted and possibly rectified with suitable intervention. The origin of the negative tendency might involve unsafe attachment, acceptance of the child only via performance, conditional love. The SOM cluster *Unhappy performers*—was emphasized by selective and general education. Girls were overrepresented, as well. This cluster evidenced that a high achievement is not a guarantee of more intrinsic self-regulation and well-being. The school achievement of the students in this cluster was above the sample average (GPA 8,2), but basic psychological needs fulfilment was second lowest—not significantly different from fifth cluster, the lowest GPA-group—self-regulation was not high, either. Of general and selective education students about 30% followed this unfavorable pattern (grey bars in Figure 43).

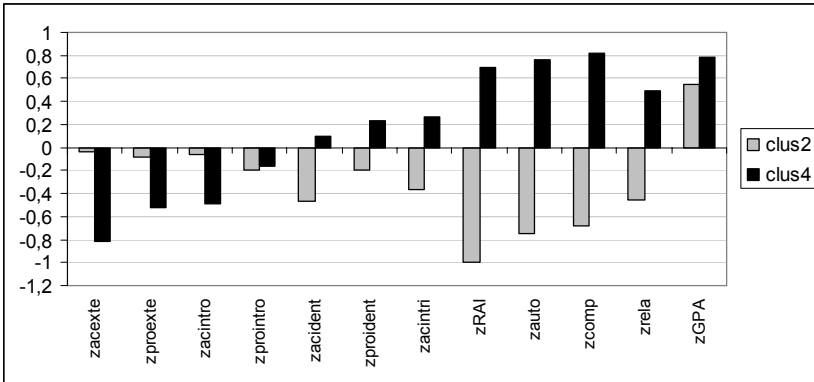


Figure 43. Comparison of the two different self-regulation and well-being patterns (clus2=*Unhappy performers*, clus4= *Happily successful*) connected to above average GPA (difference >.30 significant; in GPA >.24).

8.1.7 Predetermined school careers—in the light of psychological well-being, questioning the criteria and necessity for early classifications

That certain educational groups were emphasized in more advantageous clusters, and others in more disadvantageous, leads to questions about the selective processes which determine the class or group a student ends up in—and the consequences resulting from this selection. Throughout this study the selective educational groups, Music, English, Math-Science have shown to be connected with better outcomes, psychological, self-regulation, performance, and the special needs groups to less good (the mean tendency is this, even though also deviating subgroups were revealed, as just explained). This automatically leads to the conclusion that the entrance tests are quite fatal—in a way on average they guarantee future school success.

Because the selection (=tests) are organized already in the elementary level, or in the transition phase to middle school, there is not much children themselves can do to influence them. If one wants to be provocative, and look at the matter from a socio-cultural perspective—the real selection, in fact, is likely to happen *between the parents*, and has probably started much earlier than in the elementary school. It might have involved bringing the child to the right place at the right time, and being able to identify and grasp the possibilities the environment offers for the child—provide proper language, ways of behaving etc. Thus, probably more important than the actual

abilities, or giftedness is a child's ability to be born to parents who—apart from loving them—also realize what the child needs in order one day to pass the entrance tests (play the violin for the music teacher jury, to describe the window view in English for a native English teacher, or to solve a mathematical problem in a waiting room for a top-middle school). As important are the factors that relate to ending up in the least advantageous group which is generally considered to be a class with emotional and behavioral needs¹⁸. According to Bourdieu (1986, 1998) the knowledge of the useful educational investments is culturally inherited, and differences in this cultural capital have effect throughout the school system.

Those groupings aim to answer the needs for students. However, well-being/success/all good, ill-being/failure/all poor seem to be tied with the groupings too much like a law. These self-evident connections are what schools should fight against. When it is true that school probably never gets rid of its urge to categorize students, the criteria of those categorizations should be reweighed and reconsidered—having courage and enough foresight to jump over old mind-binding fences. For example: Why not organize—in the first place or in addition—specific music, art, science, sport classes for students who have emotional and behavioral needs—who decides they do not have more urgent needs for art or other which could reduce emotional difficulties and support balance in addition to other benefits?

When further considering the earlier mentioned idea of the 'first, second and third voice', it is possible to speculate what kinds of mechanisms could be behind the groupings. These favorable groupings could be thought to happen due to some parents (the first voice) having extra power, and these unfavorable groupings due to situation where the power of the parents is in jeopardy. When the first voice is in trouble, the institutional authority, society (the third voice) has to try to compensate the weakened power of the parents and to show the 'un-disciplined' child or student (second voice) its place. That means that the institutional authority wants to "re-educate, discipline, cure, shun, silence or banish" the second voice (Focault, 1975, see Cheyne & al., 1999). This involves implementing various cure-techniques, special therapeutical and educational means. The growing figures of special education in Finland might be more understandable if we would consider the situation using this kind of conceptual framework.

¹⁸ or a "flexible group" or "supportive group for adjustment and emotional needs", whatever the current name is.

8.1.8 Girl-power in prosocial behaviors; however, all would benefit of enhanced prosocial identified self-regulation

One central issue of school debate is whether there are differences between boys and girls in learning and learning related matters and processes. Studying the self-regulation means showed that academic self-regulation was not gendered. The SOM-analysis showed, however, that in the least motivated cluster boys were the clear majority, and girls in the *Unhappy performers*. When studying the correlations between achievement and academic and prosocial variables and basic needs fulfilment, no significant differences were found between the correlations between boys and girls.

However, although gender was overall a relatively weak variable, in prosocial domain it was more important than the educational groupings and as or more important than age. Of the prosocial identified self-regulation gender explained 11% in one of the models. The higher identified prosocial self-regulation of girls than boys implies that girls are more mature in their prosocial behavior; tend to help, share and have concern for others more than boys. On the other hand, there was somewhat more introjected pressure and anxiety involved in the behavior of girls, which seem to indicate that girls are overall more involved with social relationships, and in addition to unselfish also egoistic and approval seeking motives influence their behavior. The result of girls being more prosocial than boys is in line with the results of prior studies.

Prosocial identified has shown to be beneficial for social relationships, coping and adjustment (Juvonen & al., 1996). Maybe that's why the relatedness need was slightly better fulfilled for girls than boys. One can further speculate whether better grades of girls are partly related to this behavior, because teachers might reward it, like Wentzel (2005) suggested. Practicing the prosocial strategy has shown to be beneficial not only for academic achievement (like the alternative, coercive strategy)—but also popularity (Little & al., 2002).

One can further speculate whether the students in the second cluster *Unhappy performers* could be the ones who more than others emphasize the coercive strategy—that could one piece of explanation why their needs are less fulfilled than for many others. They also had a rather low prosocial identified regulation. The *Amotivated low-achievers*, in turn, might be those who have no strategy at all, which according to the Resource-Control theory (Little & al., 2002) is worse than having the performance-oriented coercive strategy.

From the special educational view-point supporting students towards the prosocial strategy is, thus, important—and on the basis of the present study, it seems to be more crucial for boys because they had overall lower prosocial identified scores. However, it is also important for those students who ended up in the low well-being clusters. Identified prosocial behavior can compensate other factors to compensate other factors which harm learning and adjustment—like the effects of the neurological or sensory impairments, as it has been claimed (cf. Juvonen & al., 1996).

8.1.9 The level of self-regulation and basic psychological needs combined with age

Age was the most important factor in academic self-regulation. The younger the students were, the higher their self-regulation was in general. However the relative autonomy experience of the younger students was negative, because they also had more high external self-regulation styles. In the older groups the external self-regulation style changed to a more emphasized introjected style along with age. Like in other studies self-regulation values became lower in the middle school level also in this study.

The overall prosocial self-regulation level lowered with age. The identified self-regulation was not more endorsed than the more external self-regulations. This seems to be in discrepancy with the theoretical assumptions: more other-concerned prosocial behavior and developed moral thinking would have been expected to be related to increasing age.

Although age had an effect on basic psychological needs fulfilment, it was small—smaller than that of educational group. Elementary level students had significantly higher scores in competence and relatedness and the strongest point in the profile was competence; in the middle level it was the lowest and autonomy the highest. The peak in the basic needs fulfilment in the end of the elementary level, was a result that was not found elsewhere—in the middle school the scores dropped. Maybe the Finnish school puts an extra effort just before the transition in order to reduce the bad effects the change has been quite extensively shown to cause.

8.1.10 The effect of self-regulation and well-being on GPA not uniform, but varies by group

The strength of the connection between the academic self-regulation variables and achievement varied between the groups: they were more important in the middle than in elementary level, most important in selective education then in special education and last in general education. In selective education the intrinsic variable added more than one third of a grade into GPA. In this group identified self-regulation affected the performance negatively by diminishing it which is in discrepancy with theory: identified indicates adjustment and acceptance of school's goals and would be expected to enhance GPA. Also external had a negative effect, introjected a positive one in selective education.

In special needs education intrinsic variable was the only significant explainer of the self-regulatory variables—so the enjoyment of task and work enhanced the achievement (or good achievement enhanced the enjoyment of work!). Because no other self-regulatory variables was connected to achievement in special needs education, it seems that either giving rewards or administrating pressure is not a teaching method there—or those have no effect on the achievement of these students. Because the more external self-regulations were favored in special needs group, however, it is more likely that they encounter those during the lessons, but only deeper engagement along with intrinsic enjoyment leads to better outcomes.

In general education intrinsic variable was a little less important than external, but the external had a negative effect—as always, when it was significant in the models.

In the elementary level external had a negative effect on GPA, intrinsic none—in the middle level only intrinsic was significant.

In this study of the prosocial variables only prosocial identified self-regulation was a significant factor on school achievement. On the basis of prior results one would have assumed a stronger impact (cf. Juvonen & al., 1996). Although prosocial introjected self-regulation correlated slightly with GPA, the effect vanished when it was regressed with other factors on GPA.

Of the basic psychological needs competence need fulfilment had a moderate effect on achievement, especially in general education, autonomy and relatedness a weaker and negative one. The result that autonomy (in general education) was found to have a negative effect on school achievement, seems to be in discrepancy with the theoretical assumptions. However, the negative impact of autonomy has been reported earlier, too, and was then explained by

cultural differences—autonomy could have been negatively comprehended as a lack of care—this can be true also in the present general education sample.

Relatedness had a small negative effect on performance in special education and in the middle level—a bit smaller in the elementary level. The negative effect of relatedness on achievement has been explained in the literature by the tendency of some students to concentrate too much in social interaction. This leads to less time spent on practicing academic skills, and through that to decreasing school achievement. Another slight indication—although not statistically significant—of the present study concerning relatedness and performance was in line with some earlier results: highest performance was not connected with highest relatedness. According to the Resource-Control Theory (Little & al., 2002) this could be due to an imbalance between egoistic and unselfish goals; when the former are emphasized it can cost popularity—relatedness. Too much effort in gaining competence goals, and the resources they demand, might mean deprivation of social relationships, and being left with fewer resources those interactions could offer.

Being in selective education enhanced achievement in the middle level by half a grade, but not in the elementary level. Being in special needs group, in turn, caused the GPA to drop down by a whole grade—more so in the middle level than elementary level. Of the groups the worst effects were those of LD and EB (more than a grade).

8.2 Support for basic psychological needs fulfilment and self-regulation: a bigger picture

Although this study focused on school, earlier studies and the present findings imply that it is useful to look at the bigger picture concerning this issue. The complexity of the basic psychological needs fulfilment in school becomes more understandable, when, at least somewhat, the situation is considered taking into account other factors that simultaneously influence school, like attachment and parental involvement. It is not of minor importance whether school authorities and teachers realize how manifold the psychological well-being phenomenon is, and what possibilities they have and limits they encounter when planning well-being supportive environments.

The empirical studies have shown that attachment has much influence on basic needs fulfilment and self-regulation, even when the students become older. The secure attachment allows a child to freely engage in school activities. Securely attached children have been found from early on to be more intrinsically motivated and to dare to explore their environment more than

others do. (La Guardia & al., 2000; Harter, 1999). Although the early attachment styles have been shown to change somewhat (due to diverse life-events, for example, birth of siblings, parents' divorce etc.), they continue to affect individuals in middle childhood and adolescence, and even over their lifetime. Thus, securely attached children have a cumulative lead over others. (Deci & al., 2000). Because they are encouraged to explore, they get more concrete and mental material to investigate, more achievements to be proud of, a greater sense of competence—and through that even more interest to go on. When considering the present study—those children most probably are overrepresented in the most favorable clusters, they are found among those students who seem most to enjoy their life and schoolwork.

The more unfortunate clusters of this study are likely to at least somewhat be emphasized by the opposite of last mentioned, insecurely attached children. Insecure attachment consumes a child's psychic energy by tying it to fear. The insecure styles have been shown to relate to basic psychological needs deprivation¹⁹. The ambivalent, preoccupied style interferes with autonomy need fulfilment (involving i.e. guilt of trying to be separate of parents), the avoidant to relatedness (Fear of proximity as the basis. The avoidant style, however, also threatens autonomy, because, as researchers have observed, autonomy develops best in warm relationships with others, not if a child is left alone to be too early independent and responsible for him/herself. In the disorganized style all the needs seem to be seriously threatened. Physical and psychological abuse, unpredictability and indifference about the child's needs have been found behind this insecure style. In the school environment they have been observed to be under-achieving, having the most trouble with their schoolmates and attracting worst attitudes from teachers. (Zionts, 2005, Moss, St-Laurent, Dubois-Contois & Cyr, 2005).

Attachment styles affect prosocial behavior, too (Booth-LaForce, Rubin, Rose-Krasnor & Burgess, 2005; Yunger et al. 2005). So when looking at the results of prosocial behaviors, it is useful to realize that those behaviors have deeper psychological roots than being just products of teaching good manners. An avoidant attached child has been observed not to notice when others are in need of help, and fail to show or experience affection. Preoccupied children tend to be over-dependent on their friends but being too concerned with themselves, not empathetic for the needs of others.

The most essential question concerning attachment and school is whether something can make a change in a child's life, if the primary attachment style

¹⁹ Although in general combined with a better mental health, secure attachment does not absolutely rule out mental disturbances (Goldberg, 2003).

is insecure and harmful²⁰ to both the academic and social life of the child. Is there a way to intervene? The studies suggest that a good teacher relationship in optimal circumstances could become an alternative secure base (Zionts, 2005). On the other hand, the studies (Booth-LaForce & al., 2005) have shown that friendships may somewhat compensate for early insecure attachment by giving the child compensatory security, a convenience safety haven, and thus help the integrative processes in school.

In addition to this deeper dimension of attachment, a more practical finding of earlier studies is that parental support decreases just in the transition period, and in general, during middle school (Harter 1999). The findings of the present study indicate that intrinsic self-regulation and competence experience are declining during the same period, as well. Harter (1999) points out that the influence of parents is crucial to the coping styles students adapt, and this is despite the growing impact of their peers. A positive, approach to coping has been shown to be related to parental support of the basic psychological needs fulfilment, and to a more positive self-concept. Negative, avoidant coping style leads likely to higher stress-level, depression and loneliness. (Skinner & Edge, 2002). Teenagers surely demand more freedom and space, but according to research (Harter, 1999) a true autonomy develops best if relatedness between children and parents is maintained, and the individuation process is not harmed by overt detachment and independence (Ryan, Stiller & Lynch, 1994). Missing parental support has also shown to end up in seeking for basic psychological needs fulfilment substitutes like material wealth, which as a prominent goal can lead to psychological ill-being (Kasser, Davey & Ryan, 1992; Sheldon & al., 2001); or risk-behaviors involving the use of alcohol and drugs (Williams, Cox, Hedberg & Deci., 2000).

Because the parental support and attachment style have been shown to be powerful predictors of coping, the transition problems can only partly be attributed to the organization of middle school. Especially, insecurely attached children who are categorized as preoccupied, tend to have transition problems. (Richardson, 2005).

Nowadays in our country, schools are taking quite a good care of students when they transfer from elementary to middle school—to do this even more efficiently, it would be well-grounded to ask that the parents' role should be strengthened in the middle level. Parents should be invited to cooperate and be involved in order to support the psychological well-being and self-regulation of students together with the school—like many of them did, when their children were still in elementary school.

²⁰ Note: although insecure attachment styles have been shown to relate to less well-being, this is not a law, and the whole context/child's internal factors affect coping.

8.3 Validity considerations and limitations of this study

The validity of the study was considered in the different phases of the process, in the conceptual, methodological and substantive domains (cf. Brinberg & McGrath, 1982), and including sampling, instrumentation and statistical procedures (cf. Cohen, Manion & Morrison 2000).

1. A source of bias is that the sampling method was not truly random, which is a risk for the external validity in this study, for generalizability and transferability. Attempts were made to resolve this problem by looking at the matters also in split subgroups and by examining possible interaction effects of various factors. On the other hand the sampling succeeded in covering the whole 6th and 9th grader special needs population of a Finnish scale large city.
2. A major limit of this study, which harms its ecological validity, was built in its design which did not include socio-economic variables, parents' education, or demographic characteristics as independent participant variables. Because those variables have been shown to effect, for example, school achievement in multiple ways (cf. Hautamäki & al., 2005), all the results of this study have to be interpreted against this limitation.
3. An especially big limitation of this study lies in its correlative nature. Only average tendencies could be spotted, and lots of variation remained unknown. However, the general forms a surface for reflection and allows comparison of later observations, this helps in deciding what is common or rare.
4. Because this was a cross-sectional study it did not allow true observation of development, trends of self-regulation or basic psychological needs fulfilment.
5. Triangulation was used to ensure an analysis of several aspects. Methodological triangulation happened through the use of several questionnaires. Statistical triangulation included both using different procedures on the same object, and the same methods on different objects. Combined levels of triangulation were used in a form of observing the matters in more general and more specific levels.
6. In order to ensure the internal instrument and construct validity, to be able to decide whether the chosen constructs were relevant and the instrument and indicators accurate, the literature was read, considered and compared both from the chosen theory and from the other view points, as well. In the instrumentation the questionnaires corresponding to the theory and in covering the constructs were chosen on the

basis of substantial evidence of their accuracy and coverage. However, a very basic source of bias could have lie in the translation of the questions from English to Finnish, which might have changed some nuances of the meanings. For example item 13 in BPNS: “My feelings are taken into consideration at school” might have been in the Finnish version perceived to be more related to the interaction with people (i.e. relatedness) than to aspect of control (i.e. autonomy), as it is scored in the original version. The translations were checked by the doctoral seminar participants.

7. The reliability affects internal validity. The reliabilities of autonomy and competence were—although considered as sufficient—not high, so the results have to be considered against this fact. Moreover, the BPNS questionnaire was an application into school context, which might not have fully restored the original validity and reliability of the measure. For example, the 7-point Likert scale is said to be more suitable for older students and adults than elementary level students, to whom a 5-point scale, or less, would have been more suitable.
8. The contents of the questions were sensitive, which could have somewhat led to self-defensive, socially desirable, and inauthentic answers—in spite of trying to create an open and encouraging answering atmosphere.
9. Ethical considerations: Asking students to fill in questionnaires, inquiring after information about personal matters meant in the same time involving their lives. As a researcher one had to consider what was ethical, what justified using this power to intrude, especially because the people concerned were children. One piece of justification might be that the aim was to conduct this research in a responsible manner and by using conventions of the scientific method. Even a more important aim was to organize the research in a way the participants would eagerly participate in, adapt the task as their own, see it as meaningful, even though it would take one hour of their life, and they had to choose away something else they might have been more interested in.
10. The value of this study is limited also because the effect sizes were not high—which is common in social/human studies dealing with high multi-dimensional data. The effects of the independent participant variables varied depending on the dependent variable concerned; the maximum main effect sizes are summed up in Figure 44 [Note: the effect sizes concerning GPA connections explained in corresponding sections are not included here].

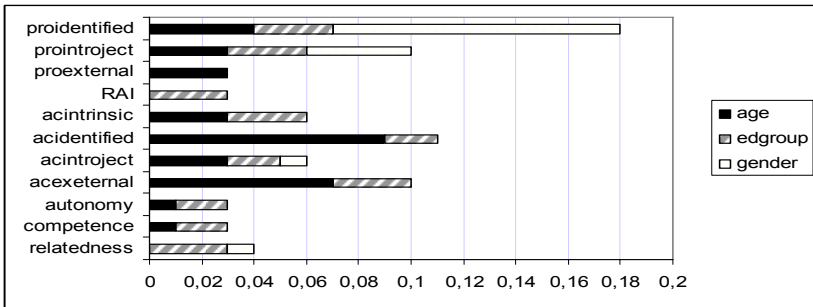


Figure 44. The maximum effect sizes.

8.4 Theoretical suggestions

The theoretical contribution of this study could be in its probing of the three needs model of psychological well-being and its relationship with self-regulation proposed by the SDT-theory. The theoretical reasoning seems to form a logical structure that can be used in clarifying and analyzing empirical findings. Inbuilt in this study was the idea that psychological well-being is a goal for its own sake, and an essential factor for self-determined self-regulation behavior, healthy development and learning.

The other theoretical issue rising from this study might be found in the presentation of the various ways to consider the psychological processes underlying the learning orientations, approaching or avoiding. It hopefully supports one to consider self-regulation and motivation as multidimensional constructs and consider those in a logical continuum instead of separate concepts. The concept of amotivation has been clarified and evidenced in some empirical studies, now this study has verified it as well. This study suggests that the concept of supermotivation should be considered as a parallel concept of amotivation, a counterpart at the other end of the quantity or intensity dimension of the self-determination continuum.

A major goal of this study has been to stress the importance of personal relationships in learning. Mechanisms in those interactions = developmentally adequate balance of relatedness and autonomy, and the quality of feedback relate to trust as prerequisite of being able to face challenges, trying without fear of mistakes. The trust is built on student’s belief that an important other, teacher, parent etc., uses power for the good for a student. That maybe could be described as a nontroubled dialogue between the first (representing the parents or teachers) and second voice (representing the student)—

and furthermore the first voice's right interpretation of the third voice (representing the institution, curriculum etc.). The genuine authority of the first voice might be comprehended not to result from a child's respect/appreciation for adults in the first place, but the direction being the other way round: the adult's respect for a child. This leads to a situation that can be described by the concept of voluntary or positive 'emotional reliance'. This is the way of learning new things, and not to underachieve and approach only tasks one knows one can handle with certainty.

The learning beneficial environments offer mental space for students—possibilities to challenge one's powers, and possibilities to make choices, and through the experienced inner locus of control feel genuine success of mastering one's environment = competence.

One essential element is to realize how easily the locus changes from internal to external—only giving the smallest rewards, symbolic praise or pressure, can harm the intrinsic motivation, and change the joy of doing to focus on performance and possible anxiety. The really supportive feedback concentrates on the process and shared joy of having had courage to try.

The nutriments of creativity, innovations, creative minds, are autonomy and play, the killers, in turn, control, competition, error focus and pressure.

8.5 Implications for intervention

Although a research project may start out of curiosity and involve play with concepts, constructs, models, be an exciting game—in the end it must step back from the abstract level and connect to the real world, showing its utility value in the form of concrete suggestions. How to proceed, when deprivation of basic psychological needs is observed, or self-regulation is externally emphasized, like in some sub-groups of the present study? The study of basic needs fulfilment is in this sense fortunate, because—as Sheldon and al. (2001) mention “need concepts are attractive, because they readily suggest psychosocial interventions”. When there is a need—it has to be fulfilled.

Learning is adaptation in new circumstances, and both the environment and the adjustment abilities of a student have an effect on this adaptation (cf. Mithaug, Campeau & Wolman al., 2003). Although self-regulation is important in the adaptation process, one cannot “cure” it by organizing courses; on the theoretical basis of the present study it is unlikely that long-lasting effects could be obtained this way. It has been claimed that prosocial behavior could be modified, and prosocial skills learned (Eisenberg & Mussen, 1989). On the other hand, it has been stated that ability for empathy and sympathy is

more essential than skills (Pakaslahti & al., 2002). On the theoretical basis of the present study the crucial point in considering intervention both in academic and prosocial self-regulation domains should be *fulfilment of the basic psychological needs*.

On the basis of this study—both theoretically and empirically—it is possible to suggest that enhancing the subjective well-being is not in the first place a question of giving more money to schools, reducing class size or providing schools with more school assistants, or special education resources, as the current school discussion indicates (cf. Opetusministeriö, 2005). We should rather consider the mental aspects—understand the importance of the pedagogical relationship, control and power dimensions and their relation to school and class climate and atmosphere. The aim should be to influence the conditions, extend the tolerance for diversity, and to help people to realize what kinds of school practices would support all students. This should replace the more or less automatic transfer of those students who do not fit the standards—like some groups of this present study—to the school’s periphery, to classes which in many occasions are also situated physically at the ends of school buildings. This is especially sad because often these students experience even before this change more alienation and separateness than the others. In an American study, for example, 40% of the students with special needs experienced not to be part of their schools (Eisenman, 2007) indicating deprivation for relatedness need.

A simple model of assessing the need for school intervention is presented in the figure 45. *Psychological well-being* is in this model translated to a more common language: *experience of happiness*; maybe it is more understandable in every-day school life. It is related to *perspective of hope* (cf. Hautamäki, Arinen & al., 2002). The model tries to describe happiness as a consequence of environmental and subjective factors’ interaction.²¹ The unhappiest situation is placed in the lowest left corner meaning low support of basic psychological needs fulfilment (either of family, peers, school or all) and indicating also individual risk-factors such as neurological disorders, developmental delay, a “difficult” temperament or others. The two minus-signs indicate serious maladjustment, which might mean comorbid learning difficulties, total deprivation of the basic psychological needs having led helplessness or opposition, anyhow non-fit of student and school environment = need for intervention. Considering this empirical study the poorest

²¹ Deci (2007) makes a distinction between ‘hedonic’ and ‘eudaimonic’ well-being. The former means positive affect and absence of negative affect, more short time feeling happy. The latter, in turn, means much deeper and persisting well-being, meaning in life. Happiness is here understood more in the ‘eudaimonic’ way.

cluster might have had these two minuses. The two plus-signs on the right in turn indicate the happiest situation; it means good learning abilities, good environmental support of basic psychological needs fulfilment having led to student’s well-adjustment, satisfaction, good fit of individual and environment = everything is in order. In the empirical study the most favorable cluster might have had these two plus-signs. The zero-signs mean average; one plus indicates better than average; one minus poorer than average school happiness.

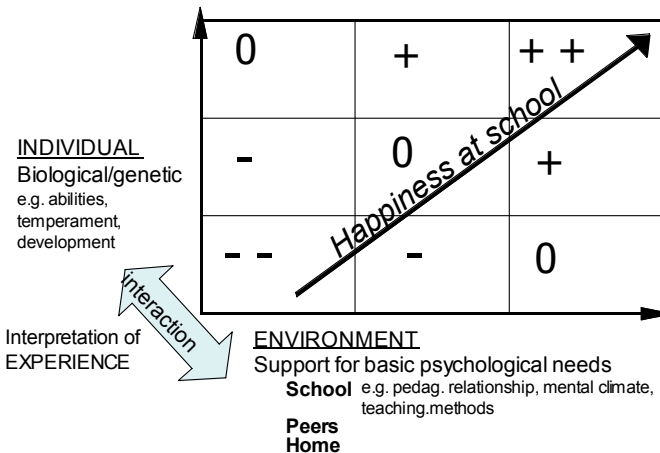


Figure 45 School happiness as a consequence of student/environment fit

A suggestion for intervention planning in the cases of having two or one minus-signs is presented next.

8.5.1 An intervention model

Intrinsic motivation cannot be enhanced without first trying to enhance the low academic competence experience (Juvonen & al., 1996), and moreover this should rather be domain-specific than global in order to be most effective (cf. Pintrich & al., 1996). The intervention should further involve trying to tap the direction of the cause and effect: for example, whether the negative self-image results from depression, or vice versa. This would be important

because the direction is related to different behavioral consequences, aggression or sadness, either directed inwards or outwards. (Harter, 1999).

In practical school-intervention planning revealing the cause and effect direction surely/probably is too demanding, but more realistic plans can be based on systematic concrete steps.

The intervention of supporting self-regulation towards integration and more intrinsic direction has to happen step by step by going back to the origin of the more extrinsic self-regulation. One has to find out why a student acts only when bribed or forced, or when feeling pressured.

The suggested intervention plan (Figure 46) starts from inspection of the quality of the self-concept, as Harter (1999) advises. If the view of self is realistic, it means that the cause of low competence is real: a student actually lacks some skills, or has some learning or other difficulties. At the action level those skills have then to be trained (cf. Pajares & Schunk, 2001), and difficulties to be compensated, compensatory sources of self-esteem to be discovered.

If the view of self is discrepant, and there is a too wide gap between the actual and ideal, or actual and ought self, it harms motivation (cf. Higgins, 1987). Then two main lines have to be considered: influencing the individual and the environment.

The individual level involves affecting the interpretations one has about self²² in the contexts and events, and one's causal attributions. This happens by enhancing meta-cognition, self-knowledge, for example in teacher-student conversations. The key-issue is to lower the anxiety-level by giving emotional support, and by altering the view (cf. Dweck, 1999) of fixed intelligence to a malleable and developing, i.e. to preferring the "incremental theory" over "entity theory".

The environmental level involves support of the psychological well-being, fulfilment of the basic psychological needs²³. The influence of environment becomes concrete in demands environment sets for an individual, and in the quality of feedback the important others give. The feedback is the link that connects the environmental and individual lines.

²² Can be comprehended as reflecting the dimension of 'being' (cf. The WHOQOL Group, 1995)

²³ Reflecting the dimension of 'belonging' (cf. The WHOQOL Group, 1995)

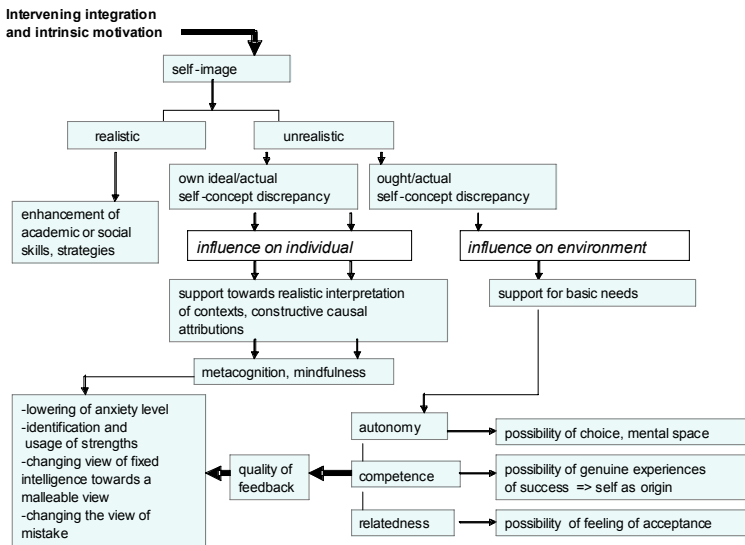


Figure 46. Suggestion of considerations for intervention planning.

In order to support those kinds of students the empirical study showed to be at risk—to support them to feel autonomous, competent and related, a solid basis has to be established. This means that there has to be willing and mature persons, who are able to compensate and support changes of the attitudes the children have about themselves and others. Moreover, because the process has been shown to be reciprocal, it also has to be discovered how to alter the usually very negative picture others have about these students at risk. For example Eisenman (2007) stresses importance of “a helpful class” as a predictive factor against drop out. The role of the peers can be seen an independent factor but also as a compensator in situations other environmental factors function negatively (cf. Booth-LaForce & al., 2005). On the other hand the role of the peers can sometimes be negative (e.g. involving bullying, cf. Junttila, Voeten & al., 2006) and thus diminish the good effects of school or parents.

Although success experiences are crucial for competence need fulfilment, experiences of failure, making mistakes are important for development, as well (Claxton, 2000; Eisenman, 2007). Thus more than a question of actual experiences, it is a question how an individual student and the whole class are guided to learn to handle mistakes they themselves or others make in a constructive manner. It means experiencing them not as shameful events which

to avoid at any price, but useful options for learning new things. Focusing on processes instead solely on outcomes promotes this goal.

The literature shows (cf. Vallerand & al., 2002) that the meaningfulness of one's existence, perspective of hope, grows out of having predictability of happenings—and its opposite, giving up hope, is related to amotivation, and to a risk of dropping out. In order to begin to manage one's life a student has to be able to see the connection between his/her actions and consequences. In some cases this means that a teacher has to attempt to build an “alternative secure base” for the amotivated student who might have had/has an unsafe—in most critical case, disorganized—attachment style with the mother or other primary caregiver.

If it is a question about a weakened parenthood, parents should be guided towards *child-centered parenting* which involves parents' ability to provide their children emotional support, suitable demands and fulfilment of the developmental needs (Kokko & Pulkkinen, 2000). Furthermore, school should be able to compensate the power loss by wise practices. Thus if parents have lost their authority either because they cannot “live up to their own standards” or they are “misguided by false standards” (Cheyne & al., 1999), teachers ought to do better, and show that at least they can earn their authority. If they cannot, it is to be expected that those students will lose all hope of getting any good from the adults. They (!) are likely to become segregated and labeled as unadjusted.

Because long-lasting effects are the goal, the only way is to get the whole school involved, and also integrate the ideas into the curriculum plan, as the meta-results of enhancing prosocial behavior of EB-students indicate (cf. Quinn, Kavale, Mathur, Rutherford & Forness, 1999). The school personal should be aware of the importance of everyday interactions, even minor ones, and practices; the quality and the affective tone of encounters in unofficial situations, in lunchrooms, schoolyards, corridors, should be comprehended equally important as lessons, and they should comprise particularly warmth and friendliness. This is crucial especially because the safety experience should remain, even if the particular “alternative secure base” teacher would not be present.

Moreover, the genuine competence experience—the essential source of more intrinsic self-regulation—could be probably most enhanced by providing possibilities to learn skills having special social status and exchange value, by giving opportunities to obtain extra knowledge and tools, by having access merely to dreams²⁴—than by restricting the school for a student to

²⁴ the dimension of ‘becoming’(cf. The WHOQOL Group, 1995).

trivial basics, by decreasing learning contents, by lowering difficulty level and demands, by being left with narrow perspectives, as often is the case. Returning back to the selection and selective class issue—if some children *need more* than others, why should they be *offered less*?

8.6 What the results could mean in educational and special educational practices

The number of special education students has grown year by year (cf. Tilastokeskus, 2007)—in such a way that in the future we even might have a parallel school system in Finland. The growing number (in the year of 2005 22% of all comprehensive school students getting part-time special education; 7% of all comprehensive school students having an official special education assignment) indicates that there is something going on the present system is not able to handle effectively. On one hand the growth can be related to better identification methods of learning and other difficulties, and better understanding of the importance to intervene as early as possible. On the other hand it can be related to increasing demands general education teachers experience, and to usage of special education as an answer. Those demands relate to the philosophy of “One school for all”, the growing tendency to full inclusion. When this idea is applied into practice, in many instances it happens mechanically and it is more just a placement of a child in a general class-room—not nearly what was planned in the Board of Education or in the city school administration. Then it is no wonder that a child there is sometimes in trouble—and the teacher, as well; although surely for the majority everything runs smoothly.

This present study can have an answer only to a small piece of this huge question. It can relate to teacher training and modification of general school and classroom practices which benefit all students but are simultaneously of crucial importance for some students with special learning, emotional-behavioral or other needs.

Many times good practices could rely on ideas which would not demand many resources but were merely a question of bringing them into consciousness. In order to manage very heterogeneous groups, one needs to maintain a structure in a class-room. This can be made either in a behavioristic way by rewards and sanctions, pressure—or by supporting the autonomy of students. These practices can be in such a way woven in every-day school-life that one does not realize them. However these simple strains can affect the whole school climate and be a bottom line in everything what is going on there. The

latter, autonomy supporting way, has shown to be a much more effective way for good long-time results—not just for the psychological well-being, but for achievement, as well. Students in this kind of environments are more accepted as they are, have more courage to engage into new tasks, are more able to monitor their own work, and are more capable of two important learning supportive behaviors: emotional reliance and the more intrinsic type concrete help-seeking behavior (cf. Ryan & al., 2001; Ryan & al., 2005).

The present study showed that the relative autonomy experience remained negative in all groups, and was poor in some special needs groups. Because children in the special classes usually have more severe problems than in general education settings, the temptation to use external control is even bigger than in general education, particularly if those problems relate to acting out-type behaviors which easily ruin all the plans teacher has. However, for those students the self-determination is more critical, and the autonomy support should especially for them be a key-issue.

What happens in the class-rooms, is analogical to ways teachers are treated in schools, how the management works. It is also analogical to teacher education practices—how autonomy supportive they are. The teacher students don't necessarily learn (or remember) what they are told, but they surely will transfer the experiences and feelings they have encountered, later into their class-rooms.

8.7 Future steps for research

On the basis of this study it is suggested that examining the self-regulation and fulfilment of basic psychological needs is not difficult, if one only knows the basics of those processes. No happening, or context as such is most important, more essential for the well-being and self-regulation are the ways a student interprets the events.

A useful complementary method to understand the dependencies of the variables and identify subgroups is suggested to be the Self-organizing maps (SOM). A way to continue the analysis is to transfer the cluster data, for example, to SPSS or Excel, and obtain the self-regulation or basic psychological needs fulfilment profiles. The SOM-maps and the profiles could further be used in exploring the well-being/self-regulation/achievement situation and its development in different observation levels, or educational domains (schools -> school -> class -> individual level; or university -> faculty -> department -> individual student). During the intervention process those profiles could be drawn several times, and after a possible intervention again.

Individual profiles could be a basis of the meta-cognitive discussion, in order to develop more adaptive coping strategies and self-regulatory skills. The collaborative project to apply SOM further in the exploration and analysis of the psychological well-being and self-regulation of university students is in early stage, but on the way. Thus, the SOM is in a first place seen as a useful method for intervention planning—not an apparatus for producing exact statistics for archives.

One limit of the present study was that it only comprised quantitative data and concentrated on correlative analysis. In order to understand complex psychological processes it is claimed to be useful to use triangulation, multi-type methods to gain a richer view. As one future step there are qualitative data from the three data collection years that are waiting to be analyzed.

Another step would involve longitudinal trend analysis from those three phases. In 2006 some of the previous items were replaced with questions that examined formal operations of the ninth-graders and also some attention-concentration tasks. In addition, there are school anxiety data to be analyzed, and the results of school experiences study to be organized.

The main purpose is, thus, to continue analyzing the elements that contribute to the psychological well-being of students in various levels and settings of education—the “quality steps”.

8.8 A majority is not enough

In Figure 47 the starting point of this study is connected to the end-point. In a way the quantitative approach and its ontological and epistemological proponents of this study meet in that picture the other paradigm, interpretive. The picture represents the individual view of experience—which could as well have been in a form of an interview, or open sentences, or some kind of narrative—and been basis of an alternative way to conduct this study. The quantitative approach was preferred, because the aim was to capture the relativity of the experience. The relativity means revealing the intensity, depth, severity of an individual experience in comparison to all others that was comprehended as essential knowledge for educational planning and interventions. However, the return to this picture symbolizes the importance of consideration of the individual at the end—even though the study might comprise hundreds of students, tens of groups, and whatever the frame of reference might be. When experience is studied it is always someone’s—not a group’s. Thus it cannot be enough to be satisfied if the majority feels psychologically well—but instead we should care for the one.

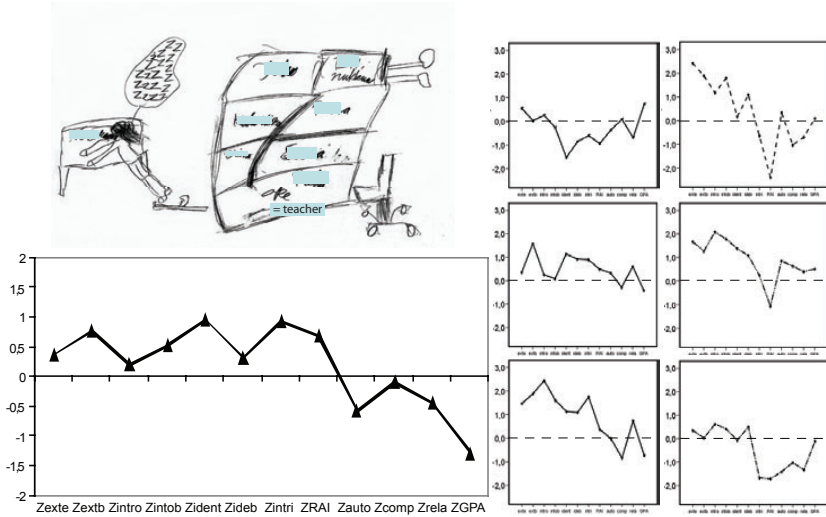


Figure 47. The picture could be interpreted as an experience of alienation and mental absence, or amotivation, non self-regulation at school. By the means of this study the individual experience was seen in relation to other experiences. The girl’s individual self-regulation and well-being profile could be obtained: her experience of school was related to a little lower than average well-being, low achievement but a rather good adjustment and intrinsic motivation. She was identified in a third SOM cluster that mainly consisted of elementary level students and boys with learning difficulties. Also the self-regulation profiles of the other students who are only identified by nametags in the picture could be drawn. The teacher’s profile seems at the first glance to be missing, but it is not: it is more or less pictured in the profiles of the students.

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Appendix 1

List of figures and tables

Figure 1.	Drawing of a girl third-grader with learning difficulties.....	1
Figure 2.	The Self-Determination Continuum by Ryan and Deci (2002).....	14
Figure 3.	Social contexts and self-determination.....	20
Figure 4.	Academic Self-Regulation and the suggested conceptual field around it.....	22
Figure 5.	Prosocial Self-Regulation and the suggested conceptual field around it.....	23
Figure 6.	The whole project design.....	29
Figure 7.	The special-educational support process at school.....	31
Figure 8.	The BPNS-variables of sum in relation to self-determination continuum.....	43
Figure 9.	The basic needs fulfilment profiles by gender.....	47
Figure 10.	The basic needs fulfilment profiles by GEN/SEN/SEL educa- tion.....	47
Figure 11.	The basic needs fulfilment profiles by elementary/middle level.....	48
Figure 12.	The effect of age on autonomy in a separate SEL group.....	49
Figure 13.	The effect of age on competence need fulfilment in SEL- group.....	50
Figure 14.	Competence experience among boys and girls in elementary and middle schools.....	51
Figure 15.	The effects of independent participant variables and basic needsfulfilment on GPA.....	54
Figure 16.	The basic needs fulfilment profiles of the five GPA percen- tiles.....	55
Figure 17.	The significant connections of the educational groups to dif- ferent basic needs.....	61
Figure 18.	The variable hierarchy of the SRQ-A.....	68
Figure 19.	The self-regulation profiles of boys and girls.....	72
Figure 20.	The self-regulation profiles of general, special needs and se- lective education.....	72
Figure 21.	The self-regulation profiles of educational groups.....	73
Figure 22.	Self-regulation profiles by elementary/middle school.....	74
Figure 23.	The estimated introjected means plot in by gender.....	76
Figure 24.	Interaction effect of elementary/middle school and GEN/SEN/SEL on introjected.....	76
Figure 25.	Estimated mean plots of identified self-regulation by gender and educational group (8).....	77
Figure 26.	An interaction effect of gender and educational group on in- trinsic self-regulation.....	79
Figure 27.	Percentages of different variables explaining GPA.....	82
Figure 28.	Self-regulation variables and related processes connected to educational groups.....	90

Figure 29. The SRQ-P and the variables of sum.....	95
Figure 30. The self-regulation profiles of boys and girls.....	99
Figure 31. The SRQ-P self-regulation profiles of GEN/SEN/SEL groups.....	99
Figure 32. The self-regulation profiles of educational groups.....	100
Figure 33. SRQ-P self-regulation profiles by age.....	101
Figure 34. Prosocial external self-regulation plotted by ed.group (8) and gender.....	102
Figure 35. The interaction effect of gender and educational group (8) on introjected.....	103
Figure 36. The significant connections between the educational groups and the prosocial variables and corresponding processes.....	110
Figure 37. SRQ-A, SRQ-P and BPNS variables for the whole sample.....	112
Figure 38. The well-being, self-regulation and achievement data shown by SOM-maps.....	114
Figure 39. The relationship between intrinsic motivation, competence and achievement.....	116
Figure 40. The relationship between external self-regulation and achievement.....	116
Figure 41. Relative autonomy experience (RAI).....	117
Figure 42. Profiles obtained according to the standardized scores of 6 SOM-clusters.....	121
Figure 43. Comparison of the two different self-regulation and well-being patterns.....	131
Figure 44. The maximum effect sizes.....	141
Figure 45. School happiness as a consequence of student/environment fit.....	144
Figure 46. Suggestion of considerations for intervention planning.....	146
Figure 47. The picture could be interpreted as an experience of alienation and mental absence.....	151
Figure 48. Prosocial self-regulation variables in relation to five achievement percentiles. Appendix 2.....	
Figure 49. Academic self-regulation variables in relation to five achievement percentiles. Appendix.....	

List of tables

Table 1. Educational groups by different observation levels.....	33
Table 2. Age groups by different observation levels.....	33
Table 3. Descriptives and reliabilities of the variables of the study.....	34
Table 4. Hypotheses and analysis procedures.....	37
Table 5. Basic needs fulfillment variable descriptives by gender.....	45
Table 6. Basic needs fulfillment variable descriptives by educational group (3).....	45
Table 7. Basic needs fulfillment variable descriptives by elementary/middle school.....	45
Table 8. Posthoc comparisons in basic needs between educational groups (8).....	46

Table 9.	Significant explainer on GPA in a model with basic needs, educ. group(8), gender and age.....	52
Table 10.	Significant explainer on GPA in a model with basic needs, gender and age in split general, special and selective education.....	53
Table 11.	Significant explainer on GPA in a model with basic needs, educ. group, and gender in split elementary and middle school.	54
Table 12.	Within group portions scoring under 4.00 all three basic needs fulfilment.....	56
Table 13.	Correlations between the academic self-regulation variables and RAI.....	68
Table 14.	Academic self-regulation descriptives by gender.....	70
Table 15.	Academic self-regulation descriptives by educational group (3).....	70
Table 16.	Posthoc comparisons in academic self-regulation variables between educational groups (8).....	71
Table 17.	Academic self-regulation descriptives by elementary/middle school.....	71
Table 18.	The significant GPA explainers in the model with educational groups (8), SRQ-A variables, gender, age.....	80
Table 19.	The significant explainers of GPA in split GEN/SEN/SEL (SRQ-A variables, gender, age).....	81
Table 20.	Significant explainers of GPA in split elementary and middle school (SRQ-A variables, gender, ed.group).....	82
Table 21.	Correlations between the prosocial self-regulation variables.....	96
Table 22.	Prosocial fulfillment variable descriptives by gender.....	97
Table 23.	Prosocial variable descriptives by educational group (3).....	97
Table 24.	Posthoc comparisons of prosocial self-regulation variables between educational groups (8).....	98
Table 25.	Prosocial variable descriptives by elementary/middle school.....	98
Table 26.	Significant GPA explainers in split GEN/SEN/SEL groups with prosocial self-regulation variables in the model in addition to gender and age.....	105
Table 27.	Significant GPA explainers in split elementary/middle level groups with prosocial self-regulation variables in the model in addition to gender and age.....	105
Table 28.	Correlations between academic and prosocial self-regulation.....	111
Table 29.	Correlations between academic self-regulation and basic needs fulfillment variables.....	111
Table 30.	Correlations between prosocial self-regulation and basic needs fulfillment variables.....	112
Table 31.	The independent participant variables in relation to the SOM-clusters.....	118
Table 32.	Percentages within independent participant group in cluster.....	122
Table 33.	Dsriptives of Academic and prosocial self-regulation and basic needs variables of 8 educational groups. Appendix.....	169

Table 34. Descriptives of Academic and prosocial self-regulation and basic needs variables in SOM-clusters. Appendix	170
Table 35. Sig. differences (Tukey, posthocs) between the SOM-clusters in academic and prosocial self-regulation and basic needs variables. Appendix	170

Appendix 2

Decriptives of dependent variables

Table 33. Descriptives of academic and prosocial self-regulation and basic needs variables of 8 educational groups.

edgroup 8		exte	intro	ident	intrt	RAI	extb	intob	ideb	auto	comp	rela
GEN	Mean	2,48	2,50	3,03	2,28	,43	2,60	2,97	3,43	4,72	4,95	5,08
	Std. Deviation	,60	,58	,53	,64	1,61	,62	,55	,52	,96	,90	,94
LD	Mean	2,69	2,53	2,99	2,19	-1,00	2,72	3,02	3,34	4,59	4,72	4,94
	Std. Deviation	,56	,65	,72	,69	1,40	,69	,62	,56	,68	,63	,63
EB	Mean	2,48	2,14	2,81	2,03	-87	2,26	2,46	2,88	4,17	4,46	4,51
	Std. Deviation	,64	,63	,68	,71	1,48	,70	,70	,74	1,06	,94	1,00
NO	Mean	2,81	2,66	3,17	2,33	-99	2,68	2,98	3,34	4,70	4,91	4,84
	Std. Deviation	,59	,64	,61	,72	1,34	,67	,58	,56	,87	,85	,94
LA	Mean	2,83	2,70	3,21	2,45	-77	2,82	3,11	3,45	4,74	5,12	5,09
	Std. Deviation	,57	,63	,57	,80	1,83	,68	,59	,53	1,01	,93	1,03
ENG	Mean	2,72	2,74	3,27	2,41	-62	2,66	3,18	3,58	4,68	5,06	5,16
	Std. Deviation	,58	,56	,48	,54	1,43	,66	,52	,41	1,06	,90	,94
MUS	Mean	2,30	2,44	3,10	2,27	-05	2,43	3,08	3,64	5,15	5,10	5,61
	Std. Deviation	,53	,56	,46	,65	1,51	,48	,41	,40	,95	,95	,77
SCIMA	Mean	2,32	2,32	2,65	2,18	-28	2,43	2,79	2,99	4,90	4,95	5,03
	Std. Deviation	,49	,69	,77	,70	1,84	,79	,68	,73	,95	,83	,96
Total	Mean	2,58	2,53	3,07	2,28	-59	2,60	2,98	3,40	4,69	4,92	5,04
	Std. Deviation	,61	,62	,58	,67	1,57	,66	,59	,56	,97	,90	,97

Table 34. Descriptives of Academic and prosocial self-regulation and basic needs variables in SOM-clusters

clusters	Acadextern	Acadintrojec	Acadidentif	Acadintrins	RAI	Prosexeter	Prosintrajec	Prosidentif	autonom	competen	relatine
0	Mean SD	2,25 ,54	2,09 ,53	2,71 ,45	1,79 ,45	-,93 ,54	2,25 ,42	3,12 ,42	4,57 ,66	4,56 ,64	4,91 ,82
1	Mean SD	2,98 ,43	3,00 ,49	3,51 ,33	2,68 ,60	-,59 ,143	3,47 ,32	3,76 ,28	5,34 ,85	5,68 ,65	5,60 ,85
2	Mean SD	2,56 ,46	2,49 ,42	2,80 ,51	2,04 ,60	-1,04 ,147	2,86 ,56	3,29 ,51	3,96 ,82	4,31 ,73	4,60 ,89
3	Mean SD	3,03 ,50	2,93 ,44	3,41 ,37	2,59 ,57	-,86 ,146	3,34 ,37	4,53 ,36	4,66 ,67	4,66 ,62	4,93 ,89
4	Mean SD	2,09 ,44	2,23 ,46	3,12 ,41	2,46 ,53	,74 ,155	2,88 ,43	5,53 ,40	5,43 ,68	5,66 ,53	5,52 ,73
5	Mean SD	2,12 ,60	1,72 ,54	2,25 ,53	1,57 ,53	-1,07 ,144	1,89 ,50	2,18 ,60	3,74 ,87	4,06 ,76	3,99 ,93
Total	Mean SD	2,58 ,61	2,53 ,62	3,07 ,58	2,28 ,67	-,59 ,157	2,98 ,59	3,40 ,56	4,69 ,97	4,92 ,90	5,04 ,97

Table 35. Sig differences (Tukey, post-hocs) between the SOM-clusters in academic and prosocial self-regulation variables and basic needs.

Acad extern: 0 and others but 4,5	Acad introjec: 0 and others but 3	Acad identif: 0 and others but 3	Acad intrins 0 and others but 5	RAI 0 and 4	Prosextern 0 and others but 4	Prosintrajec 0 and all	Prosidentif 0 and all	Autonomy 0 and others but 3	Competen 0 and others but 3	Relatine 0 and others but 3
1 and others but 3	1 and others but 3	1 and others but 3	1 and others but 3	1 and 4	1 and others but 3	1 and others but 3	1 and others but 3	1 and others but 4	1 and others but 4	1 and others but 4
2 and all	2 and others but 2	2 and others but 2	2 and all	2 and 4	2 and all	2 and all	2 and all	2 and others but 5	2 and others but 5	2 and all
3 and all others but 1	3 and others but 1	3 and others but 1	3 and others but 1,4	3 and 4	3 and others but 1	3 and others but 1,4	3 and others but 1,4	3 and others but 0	3 and others but 0	3 and others but 0
4 and others but 0	4 and others but 3	4 and all	4 and others but 3	4 and all	4 and others but 1	4 and others but 3	4 and others but 3	4 and others but 1	4 and others but 1	4 and others but 1
5 and all	5 and all	5 and all	5 and others but 0	5 and 4	5 and all	5 and all	5 and all	5 and others but 3	5 and others but 2	5 and all

Appendix 3

Questionnaires SRQ-A, SRQ-P and BPNS

The originals are found in the SDT-theory homepage:

<http://www.psych.rochester.edu/SDT/>

B								
		ei yhtään totta 1	2	3	alku totta (4)	5	6	7 täysin totta
6	Tulen toimeen ihmisten kanssa koulussa.							
7	Pysyttelen animmaksi omassa olotilassani koulussa.	1	2	3	4	5	6	7
8	Tunnin, että voin vapaasti ilmaista ajatuksiani ja mielipiteitäni koulussa.	1	2	3	4	5	6	7
9	Pidän ystäväinä niitä ihmisiä, joiden kanssa työskentelelen koulussa.	1	2	3	4	5	6	7
10	Olen voinut oppia kiinnostavia uusia taitoja koulussa.	1	2	3	4	5	6	7
11	onko koulu sinun mielestäsi turvallinen paikka	1	2	3	4	5	6	7

11= do you think that school is a safe place?

A boy fifth-grader in EB-class added his own question into the questionnaire

Academic self-regulation (SRQ-A)

The four subscales external, introjected, identified and intrinsic are formed by averaging the sum of the following variables:

External Regulation: items 2, 6, 9, 14, 20, 24, 25, 28, 32

Introjected Regulation: items 1, 4, 10, 12, 17, 18, 26, 29, 31

Identified Regulation: items 5, 8, 11, 16, 21, 23, 30

Intrinsic Motivation: items 3, 7, 13, 15, 19, 22, 27

The Relative Autonomy Index (RAI) formula:

$2 \times \text{Intrinsic} + \text{Identified} - \text{Introjected} - 2 \times \text{External}$

THE FINNISH VERSION OF SRQ-A: MIKSI TEEN ERILAISIA ASIOITA?

(vaihtoehdot: 1-4, ei yhtään totta 1, ei läheskään totta 2, jokseenkin totta 3, täysin totta 4)

Miksi teen läksyni?

1 Koska haluan opettajan pitävän minua hyvänä oppilaana.

2 Koska joudun vaikeuksiin, ellen tee niitä.

3 Koska se on hauskaa.

4 Koska olen tyytymätön itseeni, ellen tee niitä.

5 Koska haluan ymmärtää asian.

6 Koska minun oletetaan tekevän ne.

7 Koska nautin läksyjen tekemisestä.

8 Koska minulle on tärkeää tehdä läksyni.

Miksi teen oppitunnin tehtäviä?

9 Jotta opettaja ei huutaisi minulle.

10 Koska haluan opettajan pitävän minua hyvänä oppilaana.

11 Koska haluan oppia uusia asioita.

12 Koska häpeäisin itseäni, ellen saisi niitä tehdyksi.

13 Koska se on hauskaa.

- 14 Koska säännöt sanovat niin.
- 15 Koska nautin oppituntien tehtävien tekemisestä.
- 16 Koska minulle on tärkeää tehdä oppituntien tehtävät.
- Miksi yritän vastata vaikeisiin kysymyksiin oppitunneilla?
- 17 Koska haluan muiden oppilaiden pitävän minua älykkäänä.
- 18 Koska häpeän itseäni, ellen yritä.
- 19 Koska nautin vaikeisiin kysymyksiin vastaamisesta.
- 20 Koska minun oletetaan tekevän niin.
- 21 Saadakseni selville, olenko oikeassa vai väärässä.
- 22 Koska on hauska vastata vaikeisiin kysymyksiin.
- 23 Koska minulle on tärkeää yrittää vastata vaikeisiin kysymyksiin oppitunneilla.
- 24 Koska haluan opettajan sanovan mukavia asioita minusta.
- Miksi yritän pärjätä hyvin koulussa?
- 25 Koska minun oletetaan tekevän niin.
- 26 Jotta opettajani pitäisivät minua hyvänä oppilaana.
- 27 Koska nautin tehdessäni hyvin koulutyöni.
- 28 Koska joudun vaikeuksiin, ellen pärjää hyvin.
- 29 Koska olen todella tyytymätön itseeni, ellen pärjää hyvin.
- 30 Koska minulle on tärkeää pärjätä hyvin koulussa.
- 31 Koska olen todella ylpeä itsestäni, jos pärjään hyvin.
- 32 Koska saatan saada palkinnon, jos pärjään hyvin.

Prosocial self-regulation (SRQ-P)

The subscales external, introjected and identified are formed by taking the average of the following variables:

External Regulation: items 3, 6, 11, 17, 22

Introjected Regulation: items 1, 2, 8, 9, 12, 15, 16, 19, 23, 24

Identified Regulation: items 4, 5, 7, 10, 13, 14, 18, 20, 21, 25

THE FINNISH VERSION OF SRQ-P: MIKSI KÄYTTÄYDYN TIETYYLLÄ TAVALLA?

(vaihtoehdot: 1-4, ei yhtään totta 1, ei läheskään totta 2, jokseenkin totta 3, täysin totta 4)

Miksi sinä pidät lupauksesi ystäville?

- 1 Jotta ystäväni pitäisivät minusta.
- 2 Koska tuntisin itseni huonoksi ihmiseksi, ellen pitäisi.
- 3 Koska ystäväni suuttuisivat minulle, ellen pitäisi.
- 4 Koska minusta on tärkeää pitää lupaukset.
- 5 Koska en pidä lupausten rikkomisesta.
- Miksi et pilkkaa oppilasta, joka tekee virheen?
- 6 Koska joutuisin vaikeuksiin, jos pilkkaisin.
- 7 Koska minusta on tärkeää olla ystävällinen muille.
- 8 Koska häpeäisin itseäni jälkeinpäin tehtyäni sellaista.
- 9 Koska muut oppilaat eivät pidä minusta, jos teen niin.
- 10 Koska minusta ei ole mukava olla ilkeä.
- Mikset lyö niitä, joille olet suuttunut?
- 11 Koska joutuisin vaikeuksiin, jos löisin.
- 12 Koska haluan muiden oppilaiden pitävän minusta.
- 13 Koska en pidä muiden lyömisestä.
- 14 Koska en haluaisi satuttaa ketään.

- 15 Koska minusta tuntuisi pahalta, jos löisin.
- Miksi yrität olla ystävällinen muille oppilaille?
- 16 Koska muut oppilaat eivät pitäisi minusta, ellen yrittäisi.
- 17 Koska joutuisin vaikeuksiin, ellen yrittäisi.
- 18 Koska minusta on tärkeää olla ystävällinen ihminen.
- 19 Koska tuntisin itseni huonoksi, ellen yrittäisi.
- 20 Koska minusta ei ole mukava olla ilkeä.
- Miksi auttaisit jotakin, joka on pulassa?
- 21 Koska mielestäni on tärkeää auttaa, jos joku tarvitsee apua.
- 22 Koska joudun vaikeuksiin, ellen auta.
- 23 Koska tuntisin itseni huonoksi, ellen auttaisi.
- 24 Koska tahdon ihmisten pitävän minusta.
- 25 Koska olen tyytyväinen voidessani auttaa toisia.

Basic needs satisfaction at school (BPNS)

(adapted version of BPNSW at work)

The three subscale scores are formed by averaging item responses for each subscale after reverse scoring the items that were worded in the negative direction. Specifically, any item that has (R) after it in the code below should be reverse scored by subtracting the person's response from 8.

The subscales are:

Autonomy: items 1, 5(R), 8, 11(R), 13, 17, 20(R) Competence: items 3(R), 4, 10, 12, 14(R), 19(R), Relatedness: items 2, 6, 7(R), 9, 15, 16(R), 18(R), 21

The Finnish version of BPNS: KUN OLEN KOULUSSA

(vaihtoehdot: 1-7, ei yhtään totta 1 -- aika totta 4 -- täysin totta 7)

- 1 Tunnen, että voin paljon vaikuttaa koulutyöni tekemistapaan.
- 2 Pidän paljon ihmisistä joiden kanssa työskentelen.
- 3 En tunne itseäni kovin osaavaksi, kun olen koulussa.
- 4 Ihmiset koulussa kertovat minulle, että olen hyvä siinä, mitä teen.
- 5 Tunnen, että minua painostetaan koulutyössä.
- 6 Tulen toimeen ihmisten kanssa koulussa.
- 7 Pysyttelen enimmäkseen omissa oloissani koulussa.
- 8 Tunnen, että voin vapaasti ilmaista ajatuksiani ja mielipiteitäni koulussa.
- 9 Pidän ystävinäni niitä ihmisiä, joiden kanssa työskentelen koulussa.
- 10 Olen voinut oppia kiinnostavia uusia taitoja koulussa.
- (11 Kun olen koulussa, minun on tehtävä mitä käsketään. [OBS. This item was left out because it lowered the reliability])
- 12 Useimpina päivinä tunnen saavani jotakin aikaan koulussa.
- 13 Tunteeni otetaan huomioon koulussa.
- 14 Koulussa en juurikaan saa mahdollisuutta osoittaa, kuinka kyvykäs olen.
- 15 Ihmiset koulussani välittävät minusta.
- 16 Kovinkaan moni ihminen ei ole minulle läheinen koulussa.
- 17 Tunnen, että voin olla enimmäkseen oma itseni koulussa.
- 18 Ihmiset, joiden kanssa työskentelen koulussa, eivät tunnu pitävän minusta kovinkaan paljon.
- 19 Useinkaan en tunne itseäni kovin hyväksi koulutyössäni.
- 20 Minulla ei ole paljonkaan mahdollisuuksia päättää itse, kuinka tehdä koulutyötäni
- 21 Ihmiset koulussani ovat minulle ystävällisiä.

Appendix 4

More on how SOM-maps are formed

The production of the maps happens through an iteration process. In the data competition, at first, a reference grid is formed with the random pattern vectors. All nodes (=grid-points) of the grid contain one pattern vector. Next the input sample vectors (sample vector=all variable values of one student) are added one by one. The pattern vectors compete for the input vectors. The input vector and the pattern vector which correspond to each other best, are pulled strongest together. The winner pattern vector of this competition, called the best matching unit (BMU), is the most similar pattern vector, but the neighboring patterns which share similar properties are pulled in the same direction. Then especially the BMU is changed towards the input vector, also the other neighborhood proto-vectors in the grid will be changed to that direction—the less the more far the pattern vector is situated. The same process is then updated and repeated for sufficient iterations for all sample vectors. (Kohonen 1995, 2006; Kaski 1997). This action of the input vector seeking the best matching unit and the change in the neighborhood vectors is described by Kohonen (1995) in the next figure.

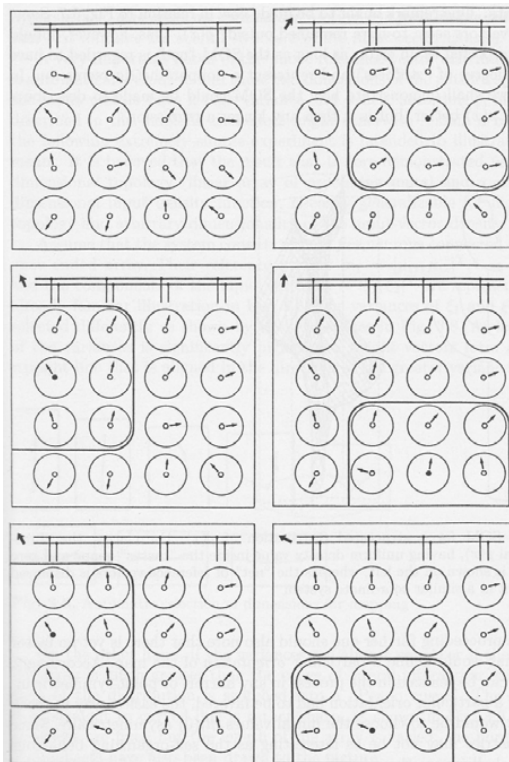
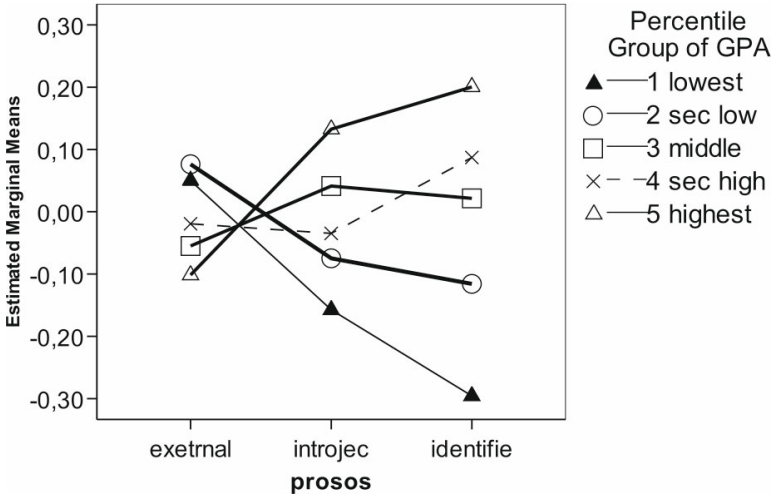


Figure (by Kohonen, 1995) The finding of the best matching unit and the change in its neighborhood vectors (the most upper corner on the left shows the starting phase. The input vectors in the other grids are marked with a bold arrow in each left corner. The best matching unit = the winner vector in each grid is the black one having a black circle in the other end. The pictures should be observed from left to right. (Note: in the present study those nodes are hexagons, not circles).

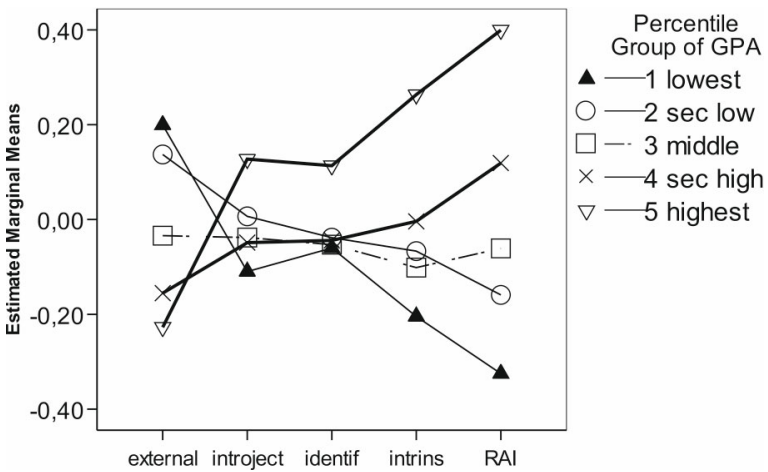
Those pattern vectors that are already in the early stage of the process very similar to the input vector change most. In the beginning even half of the nodes changes but during the process there will be less and less change, and finally the input affects only the nearest nodes of the BMU, not all. When the iteration causes no more essential moves, the outcome of the process, the SOM-maps are produced. A most optimal mapping can preserve the original structures (like when a flower is pressed in a manner that still is able so show its essential elements, as Kohonen puts it). However, the fact that the SOMs of the same data can be somewhat different in form is not a concern. Kohonen claims that essential dimensions and domains are anyway automatically found by SOM (Kohonen 1995, 2001, 2006).

Appendix 5

Two figures



GPA-percentiles & prosoc.



GPA-percentiles & academic self-reg. variables