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LANGUAGE, EMOTION AND COGNITION
EXPERIENCES FROM BILINGUAL

1. PROBLEM

1.1. Initial statement of the problem

This paper examines quantitative relationships between measurements of *language learning, cognitive development*, and *socio-emotional adjustment* in bilingual immigrant children. In part, it summarizes, but also updates a longer, more technical paper (Ekstrand 1994a). Very few quantitative, multivariate studies of such relationships have been made. The multivariate, quantitative analyses are necessary because of the many, mostly unsupported claims of causal relations between the three areas mentioned above that have been made over the last few decades (see 1.2 below).

Further, quantitative studies of interrelationships between language, cognition and emotion have a wider, theoretical interest, beyond the immediate practical interest. There has been a number of theoretical exchanges over the relative primacy of cognition and language on the one hand, and cognition, language, and emotion on the other.

The method reanalyzes data from a bank established by Ekstrand (1976a,b), covering measurements in all three areas. The results are validated against other quantitative research, as well as against a theoretical review of pertinent, adjacent areas of basic and applied research.

1.2. Hypotheses concerning bilingual adjustment

Since World War II powerful migratory patterns have appeared all over the world. From the 40.s to the 70.s, migration in the west was mostly labour movements, while the 80.s and 90.s have been characterized by refugee movements. During this period, two different schools of thought have influenced assumptions about the adjustment of migrants, and especially migrant children. Both schools have linked language development to social, emotional and cognitive factors.

The first school believed that not learning the language of the host country would induce emotional and social disturbances through lack of communication, while learning the new language could prevent or cure emotional problems (Gelinek 1974; Schumann 1975). Thus we have a hypothesis that not learning a new language may cause emotional problems.

The second school has been strongly represented by the Finnish authors Skutnabb-Kangas and Toukomaa (1976), Toukomaa & Skutnabb-Kangas (1977). They pointed out that severe emotional and also cognitive disturbances would inevitably arise from not maintaining the mother tongue. In fact, learning any new language before the age of puberty (age

10-12) would be harmful to the mother tongue development, thus indirectly causing social, emotional and cognitive disturbances. These assumptions were made in order to explain poor school results in immigrant children, as well as the occurrence of socio-emotional problems. However, socio-economic status or the social situation of the homes were not considered by these authors.

This constitutes two totally opposed hypotheses of harmfulness: of not preserving the mother tongue, and of not learning a new language. May language learning really affect the cognitive, social and emotional adjustment?

1.3. The research position on language and cognition

The mother tongue preservation school thus has assumed primacy of language over affection as well as over cognition. Strangely, this school never made any reference to other primacy debates. Primacy of language over perception of the world was argued by early linguists such as von Humboldt, Sapir (1921), Whorf (1956). These views were, in their strong form, refuted by many authors, e.g. Hoijer (1954), Gipper (1972), Oksaar (1977). Later on, famous neurologist Luria (1961; Luria/Judovic, 1959) claimed language primacy over cognition, i.e. thought. These views were strongly refuted by Piaget in several writings, by Bruner (1976, 1980), Ratner/Bruner (1978), Ninio/Bruner (1978), and by a number of other authors.

Vygotsky has often been erroneously alleged to share Luria's view, but in his book "Language and thought" (1962), he takes a position close to Piaget:

> "The history of language clearly shows that complex thinking with all its peculiarities is the very foundation of linguistic development." (Vygotski 1962: 72)
> "We find that in the child, too, the roots and the developmental course of the intellect differ from those of speech - that initially thought is non-verbal and speech non-intellectual." (p. 49)
> "In the beginning was the deed. The word was not in the beginning - action was there first: it is the end of development, crowning the deed." (p. 153)

Piaget (1962) in a post-script to this book observes how much Vygotsky and himself in fact had in common. Later on, Luria (1975) explicitly confessed himself to the Vygotsky-Piaget-Bruner view of action and thinking as primary to language.

In conclusion, the present research position is that cognition (thought processes, concept formation, etc.) is primary to, and necessary for language development. The question is, what is their *quantitative correlation*? Correlation studies will not solve the question of primacy, but they may contribute to our understanding of it.

1.4 The research position on emotion and cognition

The present debate is concerned with primacy of cognition, over emotion, or vice versa, as well as the relative independence of cognition and emotion. This is of interest also regarding language as an element of cognition.

Piaget (1981) held that affection and cognition are in constant interaction. Affectivity may be seen as the fuel of cognition, i.e. there is a functional relationship, but not a structural: affectivity cannot create new cognitive structures, and intelligence cannot create new feelings. Piaget, however, draws the attention to several authors who claim that affectivity may influence cognitive structures.

An ongoing, heated debate was opened by Zajonc (1980, 1984) who maintained that the relationship is weak, and that the two domains are fairly independent:

> "Affect and cognition are separate and partially independent systems and ... although ordinarily [they] function conjointly, affect could be generated without a prior cognitive process." (Zajonc 1984: 117).

He supported this position with empirical data on affective judgments, and neuro-scientific considerations. He was opposed by Lazarus (1981, 1982, 1984, 1991) who claimed that perception of a stimulus or situation must precede any affective response. The Zajonc (1980) paper released the heated debate (Birnbaum 1981; Zajonc 1981; Slife 1981; Baars 1981). Since then, research has rocketed,cp. Barnard/Teasdale (1990), Natsoulas (1989/90, 1990), Panksepp (1990), and many others.

The Zajonc-Lazarus-debate left several questions unresolved. Neither combatant paid enough attention to defining and examining the domains of emotions and cognition. Are sensory processes part of cognition? Is perception part of cognition or a separate domain? Should the concept ofcognition only include what is usually called "higher processes": thinking, language, etc.? Furthermore, both combatants discussed principles, but from very different types of data.

The present major school of thought is the cognitivist approach, i.e. it is taken for granted that cognition incites and structures emotions. In other words, Lazarus' position seems to be prevailing. Two examples will follow.

Ortony et al. (1988) from a cognitivist perspective list 4 types of "evidence for theories of emotion", viz. (1) Language; (2) Self reports; (3) Behavior; (4) Physiological reactions. The authors attach more weight to (1) and (2), whereas (3) is deliberately "played down" because "it is not often that these behaviors actually constitute an emotion" (p. 10). No. (4) is disregarded because it does "throw relatively little light on the cognitive component of emotion" (p. 12). The goal is "to present an approach to the study of emotion that explains how people's perception of the world - their construals - cause them to experience emotions.

We consider two questions to be central to this enterprise. The first is: 'What is the cognitive structure of the emotional system as a whole?' The second main question is: 'What is the cognitive structure of individual emotions?'" (p.12).

Thus, Ortony et al. (1988) ask questions in which the answer is already given. This constitutes a classic example of preconceived opinion and circular reasoning. Every conceivable way of violating objective scientific examination is pursued. Whatever does not fit the pet hypothesis is left out or "played down". The problem itself is stated as *how* cognition struc-

tures emotion, not *if* it does. Verbal statements are preferred to actual behavior as evidence, because "they constitute emotions" whereas behavior (crying, feeling anger, etc.) or physiological reactions (blood pressure changes, etc.) "does not often do this". The present author, for one, would argue that it is exactly the other way round!

Another cognitivist is Frijda(1988, Frijda et al. 1989). He tries to redefine well-known emotions, e.g.:

> "Joy ... is a sense of pleasure plus the urge toward exuberance and contact-seeking. Anger is a sense of displeasure plus the urge to do some of the things that remove or harm an agent." (Frijda 1988: 351)

These attempts do not at all clarify what these feelings are. It is hard to imagine a playwright giving stage instructions of this kind, or an actor attempting to represent them.

Although the cognitivists seem to be a majority at present, there are other opponents than Zajonc and the present author. Griffiths (1989) points out that the cognitivist approach involves (a) a claim that the occurrence of "propositional attitudes", i.e.evaluative judgments, is essential to the occurrence of emotions; (b) a claim that the identity of any emotional state depends on the propositional attitude.

Griffiths sees six important problems in the cognitivist approach. (1) Objectless emotions, such as depression, elation and anxiety, are simply denied. (2) Reflex emotions, such as fear of earth-worms, etc. cannot depend on evaluative judgments, no-one would entertain a propositional attitude that earth-worms are dangerous.(3) Identifying emotions with evaluative judgments results in far too many emotions, and many evaluative judgments do not contain any emotion at all.(4) Cognitivists claim that specific judgments entail specific emotions, but this is not true: "A is a good pianist" may give rise to admiration, envy, or possibly other emotions. (5) The cognitive theory neglects physiological aspects of emotions. (6) Cognitivists claim that we cannot have pure emotions regarding imagined objects or events, which obviously is false.

If the cognitivist theory is correct, we should have sub-stantial statistical correlations between measurements of cognition and emotion. Absence of correlations would indicate relative independence, which the cognitivists vehemently deny.

1.5. The research position on language and emotion

To test the assertions of strong associations between language and other domains, notably socio-emotional variables, Ekstrand (1976 a, b) computed averaged correlations between the domains of language, socio-emotional adjustment, non-verbal intelligence, and oral reading among immigrant students. Correlations within the three domains of language, socio-emotional adjustment, and non-verbal cognition were substantial (see Table 3). Surprisingly, in view of all the strong claims that either L1 or L2 may be related to the social and emotional adjustment, correlations between the language measurements and the socio-emotional measurements were close to zero. Various control measures, such as computing

within-group correlations controlling for age, sex, etc. gave the same result. Systematic search for language-affective or cognitive-affective correlations (see review in Section 2 below) reveals an interesting picture: nowhere has any substantial correlation between affective and cognitive measures been found. Rather, it seems that the purer the measurements, the lower the correlations. In other words, if some moderate coefficient is found, it can be ascribed to a confounding of emotional and cognitive components(Ekstrand, 1976a,b, 1978a, 1980a).

However, virtually all studies have used simple correlations techniques. It remains to study associations between the various domains with some multivariate method.

1.6. Research questions

The present research aims at finding answers to the following questions:

1. What is the quantitative association between domains of language measures and measures of cognition? Data will be sought in the literature and in the present reanalysis.
2 Is Oral Reading predominantly a technical perceptual-motor skill, or is it an integrated part of language?
3. Regarding Bilingual Adjustment, if there is a strong association between language and cognition, will mother tongue preservation promote cognitive and linguistic progress? Empirical data will be sought in the literature.
4. What is the quantitative association between domains of cognitive measures and measures of socio-emotional adjustment, i.e.emotion and cognition? Data will be sought in the literature and in the present reanalysis.
5. What is the quantitative association between domains of language measures and affective measures of socio-emotional adjustment, i.e.emotion and language? Data will be sought in the literature and in the present reanalysis.
6. Is there any evidence for a causal, disruptive influence on affective factors from learning a second language? Data will be sought in the literature and in the present reanalysis.
7. Is there any evidence for cognitive primacy over affective factors? Data will be sought in the literature and in the present reanalysis.
8. Is there any evidence for relative independence between cognitive/language and affective factors? Data will be sought in the literature and in the present reanalysis.
9. Is there any evidence for affective primacy over cognitive/language factors?

2. METHOD

2.1 General research strategy in brief

The methodology consists of three parts: *I. a brief review of empirical research findings*; and *II. a reanalysis of previous data with a multivariate technique, viz. canonical correlations (Rc) between domains of measurement. III. a theoretical analysis of pertinent related*

areas. All the four domains of measurements, as well as all the research questions stated above are covered in the research reviews as well as in the reanalyses. It may be argued that this makes the paper complex, and perhaps difficult to grasp. However, leaving out areas to make the matter less complex would be a mistake: it would not simplify, only hide certain relationships.

The empirical research review was done in the following ways. (a)Some selective reviews by Ekstrand (1976a,b, 1992, 1994a), based on covering more than twenty years of related research, have been summarized;(b) Computer based searches in dialog and other data bases on the issue of affection in relation to cognition/language have been performed: (c) manual search in some later volumes of Psychological Abstracts to counteract inevitable limitations in the computer search. The studies reviewed have been selected on the criteria that actual coefficients of association be reported, or that pertinent data of theoretical interest be included.

Most of these results are given in the results part. However, some of the data on affective or cognitive primacy and relative independence will be given in the discussion part.

The empirical reanalysis data are presented relatively briefly in this paper; more detailed, technical presentations are given in Ekstrand (1994a).

2.2. Description of the reanalysis data

For the present study, a data bank on immigrant students in Sweden was used. A number of reports using this data bank have previously been published (Ekstrand 1976a,b,c, 1979, 1980a, 1984, 1992, etc.). The data comprise 2,188 students in grades 1-9 of 36 nationalities. A questionnaire for the 2,188 students had been filled in by 852 teachers of Swedish as a second language. The teachers had been asked to perform a number of ratings of socio-emotional adjustment and administer a number of tests of Swedish and non-verbal intelligence. There is a varying amount of return of data for each variable. Instructions were given non-verbally so that test performance would not be contingent on the students' ability to understand instructions. Accounts of representativity, return of data, missing data analyses, etc. are given in the above references. It was shown that missing data were not systematically related to the outcome of any measurement variable.

There are four sets of data variables: (1) language variables; (2) socio-emotional adjustment variables; (3) oral reading tests; (4) non-verbal intelligence tests.

A number of language tests were constructed for the study, viz. Listening Comprehension, Reading Comprehension, Dictation, Free Written Production, Pronunciation, and Free Oral Production. The latter two were recorded on sound tape and then rated. Because of these troublesome procedures, they have been given to a smaller number of individuals. The tests form a domain of Language Proficiency, with an average Pearson intercorrelation of $r = .57$.

The teachers had been asked to rate the students with respect to a) Progress in School; b) Social Adjustment; c) Emotional Adjustment; d) Progress in Swedish. As it happens,

these variables intercorrelate quite substantially; the average Pearson correlation is .52 (Table 3 below). In other words, the teachers have not always been able to separate emotional from cognitive observations: a quiet student may be thought to be shy, or non-proficient in Swedish, or both. Also, judgements of social characteristics are often given in emotional terms. Thus, this domain is highly affectively loaded and is regarded as a domain of Affective Adjustment.

Three Oral Reading Tests were intended to measure skills of reading. No measure of understanding was included. Each test consists of (a) syllables; (b) words; and (c)sentences. For each test, three measures were obtained, viz. (1) time used (up to 2 minutes); (2) number of words read; and (3) number of errors. The variables intercorrelate .75 on the average, and form a dimension of Reading Ability.

Finally, three group tests of non-verbal intelligence were administered for students in grades 4-9. The DBA 4 belongs to Thurstone factor R (Reasoning), DBA 7 to factor S (Spatial ability) and DBA 8 to factor N (Numerical ability). These tests intercorrelate .33 on the average and form a domain of Nonverbal Intelligence.

2.3. Statistical treatment

Simple correlations between individual variables, within domains and between domains, do not give the whole picture, and do not extract all the information. In order to optimize comparisons of the relations between domains - which is our primary interest - canonical correlations (Rc) were computed.

The canonical correlation (Rc) is the *maximum correlation* between linear functions of two *sets of variables* measured on the same subjects (Cooley/Lohnes 1966: 35). Several linear combinations are often possible. Chi^2 tests are used to reveal how many of the Rc.s are significant and allow statistical interpretation.

A useful statistic is the redundancy for a set, given the other. The technical explanation is given in Cooley/Lohnes (1977: 170). Briefly expressed, the redundancy is the amount of variance that is explained by one set in addition to the variance already explained by the other set. In other words, if one set contributes considerably more than the other, this is shown by the redundancy. In addition, it is desirable to look at the structure of the sets of variables, which may be done with factor analysis (principal component analysis).

A correlation between two sets of measurements will tend to increase when it is maximized, in comparison to simple correlations. Thus, an association may appear, although domains seem unrelated when compared variable by variable. The seemingly low associations obtained previously on these data (Ekstrand 1976a, b) may appear in a somewhat new light if there is at least one significant way in which the two domains are related. The computer routines and the statistical basis were all taken from Cooley/Lohnes (1966).

As data matrices must be full to allow computation, missing data have to be filled in. Studies indicate that as much as 20% completed data may still give a valid result. A com-

mon method is to insert the mean of the variable in empty places. In this case the better method of inserting regression estimates, based on genuine data in the various variables, was used.

3. RESULTS

3. 1. Review of some previous results

3.1.1. Results of studies of the relationship between affection and language in second language learning

Many correlation studies of the relationship between the affective and the language domains exist. A selection is reviewed, and also some experimental evidence. Several types of correlation coefficients can be squared, which will give the percentage of variance common for the two variables. E. g., a coefficient of .25 means 6% in common, and a coefficient of .45 is required to indicate 20% variance in common. Only at .45 may we speak of a substantial association, but it should be remembered that still 80% of the total variance is specific for each variable.

Lambert et al. (1963), Gardner/Lambert (1959) and Gardner/Lambert (1972) found very low correlations between L2 achievement and attitudes towards the French people, language and culture, as well as measurement. This was a rather surprising lack of association as it contradicts the hypotheses. However, instead of discussing this, the authors draw the opposite conclusion, i.e. claimed the importance of attitudes, motivation, etc. for L2 acquisition. It is also emphasized by Burstall (1975), and others. However, correlations between attitudes and achievement tend to be rather low, both for language acquisition, and for the acquisition of arithmetic skills, or skills in any other academic subject. This is also the case with many motivational measures, another affectively loaded domain which is assumed to be of great importance in learning.

Bhatnagar (1970), studying immigrant students, found correlations between five affective measures of adjustment, such as anxiety,and academic achievement ranging from .09 - .45. Correlations with spoken English ranged from .28 - .23, with IQ from .18 - .48. Haynes (1971) also found low correlations (.03 and .07) between social adjustment and vocabulary, and between social adjustment and language and arithmetic ability of -.03 to .13.Ekstrand (1976a,b) found very low correlations between second language tests among immigrant students and measures of emotional and social adjustment.

As discussed in more detail in Ekstrand (1979), Guiora and his co-workers, adults hypothesised to develop a language ego, just as children develop a body ego. This language ego sets boundaries which help to establish the speaker's identity, but may also hinder the acquisition of a second language. In several experiments, Guiora et al. (1972) and Schumann et al. (1978) have demonstrated that L2 pronunciation improves after intake of alcohol or under hypnosis. The assumption is that the permeability of ego boundaries increases

(i.e. the resistance diminishes) when inhibitions become weakened. However, the link between the experimental condition and the theoretical explanation is weak, however, and the quantitative strength of the assumed association is not provided.

Cziko et al. (1979) expected attitudes towards a second language and ist culture and people to improve after closer contact. Some English-Canadian and French-Canadian students exchanged schools for some time. Depressingly, scores on 11 different affective instruments *decreased* after the experience.

Lambert et al. (1963) tried to separate the emotional component (feelings towards a language, etc.), calling it integrative motivation, from the cognitive component (usefulness etc.) of motivation, calling the later instrumental motivation. They however, (ibid.) obtained only a low correlation between attitude and achievement of .23; and between integrative/instrumental motivation and language achievement of .25 in American students taking elementary French. Corresponding correlations in an advanced group of students were in fact negative, although as low as to be insignificant. Gardner/Lambert (1959) obtained a correlation attitude - achievement of .10 only, a correlation of integrative/instrumen-tal motivation and language achievement of .34, and of motivation intensity and language achievment of .40. The motivational measure contained items such as "amount of home work put down", and others, which rather measure time and activities, i.e. volition and cognition, than feelings or intentions. This may explain the slightly higher, but still low correlations. Gardner/Lambert (1972) obtained a large number of correlations between attitudinal and motivational measures on the one hand, and language achievement measures on the other. Nearly all coefficients were below .40, i.e. all pairs of measurements had less than 20% of the total variance in common.

Lewis/Massad (1975) give correlations for attitudes towards English in ten countries (Perceived Utility of English; English Activities Outside School; Interest in English) and achievement in English. The mean correlation over all countries and student populations (computed by the present author from data in Lewis/Massad) are .21 for Perceived Utility, averaged for all achievement tests, .25 for English Activities, and .29 for Interest. Out of a total of 168 coefficients, 114 (73%) are below .30 and 129 (88%) are below.40. As seen from the facts of the IEA measures above, the attitude measures are heavily loaded with non-affective factors, cognitive factors. Still, the correlations are not very high.Carroll (1975) reports the results from another IEA study of French as a foreign language in eight countries, using almost identical measurements.Results of the multivariate analyses suggest that the attitudinal and motivational measures contribute very little to the achievement in French, although actual correlations are not reported.

Taft/Bodi(1980) found no relationship between preference of language usage and the competence in either English or Russian in bilingual children, or in the dominance of one language skill over the other. Nor was any relationship found between language competence and integrative or instrumental motivation.

3.1.2. Results of studies of the relation between affection and first language proficiency

Leijonhjielm (1965) studied the association between a composite measure of tests in Swedish for native students in grade 6 and five personality scales developed for the purpose (N = 850). The results are summarized in Table 3. As seen, the coefficients are so low as to be negligible. Johannesson (1967) found correlations in grade 6 between Reading Swedish (native students) and attitudes to (a) the school situation; (b) class mates; (c) the teacher, varying from .02 to .43, i.e. 0 to 18% of the variance in common.

Table 1. Correlations between personality scales and achievement in Swedish.
Leijonhjielm (1965).

Personality scale		correlation r
Lability	(afraid of being alone, etc.)	-.32
Introversion	(not being much with friends, etc.)	-.06
Weakness	(preference for soft spare time activities)	0.00
Sense of duty	(preference of useful occupations)	.20
Dominance	(avoiding flattering the teachers, etc.)	-.14

Ericson (1980) found correlations in grade 6 between Reading Swedish and "Emotional disturbances in preschool", "Emotional disturbances in grade 2", and "Hostility", of .14 to .29.

3.1.3. Summary of language and affection studies

In summary, attitudinal and motivational measures show only slight to low correlations with language achievement, be it L2 or L1. Moreover, the direction of possible causality is far from self-evident. Therefore, the strong claims regarding the importance of attitudes in language learning, or learning being improved by improving attitudes through means of more native language learning, do not seem warranted. The weak associations between emotional measures and language learning seem to be part of a more general pattern of weak associations between the cognitive and affective domains, as is discussed below.

3.1.4. The relation between affective and cognitive measures

The order of magnitude of correlations between affective and cognitive variables is generally very low. Svensson (1971) computed 672 coefficients between school adjustment and interest for spare time activities on the one hand, and on the other relative achievement in school subjects in large samples of students in the Swedish elementary school. They are typically very low, more than 75% are between ±.10 and none above ±.30. Aiken (1970) covered more than 70 studies on the relationship between attitudes towards mathematics and achievement. He found that "measures of anxiety and attitudes towards school subjects

typically have rather low correlations with measures of intellectual ability" (p. 564). Neale (1969) discusses the role of attitudes in learning mathematics and reports correlations from several studies, with the same outcome of low correlations. Ekstrand (unpublished data) has found very low correlations between interest in physics and grade marks as well as test results on rather large samples.

All claims of substantial coefficients have, when controlled, turned out to be in reality low. We may regard it as a law of nature that correlations between cognitive measures (to which language belongs) and affective measures are pervasively low.

3.1.4. The relation between language and cognition

A few examples of studies giving the order of magnitude will be reviewed here. The selection is such that measures of intelligence have been correlated with measures of L2 learning. The language variables have usually comprised listening and reading comprehension, pronunciation, and sometimes writing tests. The data have been summarized in Table 1.

It is clear from the collection of studies (1) that the association varies with type of language variable and type of intelligence assessed; (2) that the association is low to moderate; (3) that it does not seem to matter whether the intelligence measure is verbal or non-verbal; (4) that whatever causality there may be, it cannot be complete. Furthermore, *if there is causality*, it works both ways, not only in one direction as is often claimed.

Table 2. The association between intelligence and L2 learning in primary and secondary school students (various sources)

Intelligence measure	Students' nationality	Target language	Author	Publ. Year	% variance in common
Thurstone Rfact	Immigrant	Swedish	Ekstrand	1977	5 - 21
Verbal	Swedish	German	Löfgren	1972	.2 - 20
Verbal	Swedish	English	Ekstrand	1962	5 -32
General	Swedish	English	Ekstrand	1964	6 -16
General	American	French	Gardner/Lambert	1972	.1 - 16
Thurstone Nfact	Immigrant	Swedish	Ekstrand	1977	2 - 12
Thurstone Rfact	Swedish	German	Löfgren	1972	0 -10
Thurstone Sfact	Immigrant	Swedish	Ekstrand	1977	.1 - 7

Finally, it may be mentioned that in reports of the cognitive and language development over age from the present data bank (Ekstrand 1976c, 1979, 1994b), the cognitive development was quite normal, following the same progression and levels as a major Swedish sample using the same tests. The learning capacity increased from ages 6 - 17 on all the language measures. The means, dispersions, and all other data were similar in the immigrant group as in the Swedish standardization sample.

3.1.4. Evidence on the mother tongue hypothesis from evaluations of mother tongue and bilingual programs

Some evidence regarding the possible influence of mother tongue preservation, and hence indirectly of the possible influence on social and emotional factors, may be found in evaluations of bilingual school programs. Evaluations of bilingual programs in the USA and elsewhere created disappointment in these programs, be it mother tongue preservation or new language promotion. Some of the best evaluations of mother tongue preservation programs as compared to ordinary bilingual programs have been done in Scandinavia. These evaluations are remarkable for their very high quality. Finnish evaluations (Kuusinen/Lasonen/ Särkelä 1977, Lasonen 1978, Lasonen/Toukomaa 1978) showed, much to their disappointment, that students in Finnish mother tongue classes fell behind students in Finland in mother tongue proficiency by 1.5 - 2.5 years. Finnish immigrant students in Swedish mainstream classes - with mother tongue support of several periods per week - displayed a lag of 3-4 years. Linde (1986), Linde/Löfgren (1989) could show that school success is in fact inversely related to mother tongue preservation. The more Finnish mother tongue preservation, the worse the school results in grade 6 in two replicated studies. This effect was still there, but less marked in students in grade 8. By this age, influences from the surrounding society would have had more time to act, and the development in the host country language (Swedish) has made progress.

This outcome was predictable from the study of Wieczerkowski (1971) which may be regarded as a classic in its field. He studied students in German schools abroad and compared them to students in Germany. The abroad-living students were socio-economically superior, being the children of diplomats, business executives, and other foreign-stationed staff. These students had every theoretical possibility to maintain their mother tongue. However, they fell below the students in Germany on all language tests, although their language was not at all poor. Thus, in spite of all circumstances being favorable, it does not seem possible to maintain one's mother tongue outside one's own country and culture. The surrounding culture and language will impose itself on the brain. This conclusion was later confirmed by Mägiste (1979) with German-born students in the German school in Stockholm, in the same circumstances as Wieczerkowski's students. She could show that the reaction times for active and passive vocabulary become longer in the mother tongue and shorter in the host country language, until the curves cross after 4-6 years. I.e., *nolens volens*, there is a shift in language dominance when youngsters are transferred to another culture and language. Dornic (personal communication) has data that indicate that such a shift does not occur if the person is over 20 years of age, or at least takes considerably longer.

In conclusion, it seems to be the socio-cultural setting that is decisive for language development, in L1, L2 or both, rather than the languages *per se*. The brain will learn and process the *stimuli that exist in the environment*. Hence, the idea of language actually causing

social or emotional problems becomes suspect. However, in order to arrive at a higher degree of certainty, the actual correlations between these various factors must be studied.

3.2. Results of the reanalysis study

3.2.1. Homogeneity of domains

The homogeneity of the domains is quite high, as indicated by the averaged simple Pearson correlations inTable 3, and the summary of factor structures in Table 5.

3.2.2. Factor structures

Table 3. Averaged correlation coefficients between measurements within domains of variables

Domain	average correlation r
Language	.57
Adjustment	.52
Nonverbal Intelligence	.33
Oral Reading	.75

For every set of canonical variates, a factor analysis (principal component analysis) was computed. For all domains in the various combinations, the amount of variance extracted, as well as the factor loadings, was high. An example is given in

Table 4. Factor structures for left and right sets for the Language by Adjustment domains (first canonical factor only), total variance extracted, redundancy for each set, given the other[1]

Left set		Right set	
Variables	Factor loading		Factor loading
5. Listening comp.	.55	1. Progress in sch.	.75
6. Reading comp.	.71	2. Social adjustment	.52
19. Dictation	.73	3. Emotional adjustment	.50
20. Free written prod.	.93	4. Progress in Swedish	.95
21. Pronunciation	.49		
22. Free oral prod.	.48		
Total var. extracted from left set	82%	Total var. extracted from right set	100%
Total redundancy for left set	4.7%	Total redundancy for right set	5.2%

[1] The factor loadings for the various tests (averaged for various constellations of pairs of domains) have been summarized in Table 5 for reasons of space.

3.2.3. Canonical correlations (Rc)

For every pair of domains, i.e. canonical variates, the Rc, % of variance in common between sets, and a X test of significance were obtained. An example is given in Table 5.The demands of how many variables were required to have complete data are given at the top of the Table.In Table 6, the Rc.s are presented in summarized form.

Table 5. A summary of factor loading (averages) for the various domains of measurements.

Test/Factor Loading		Test/Factor Loading		Test/Factor Loading		Test/Factor Loading	
List. Compr.	.59	Prog School	.70	DBA 4 R	.70	Read 1 Time	.43
Read Compr.	.77	Soc Adjustment	.52	DBA 7 S	.87	Read 1 Words	.52
Dicatation	.78	Emot. Adjustm.	.41	DBA 8 N	.67	Read 1 Error	.73
Free W Pro.	.79	Pro Swedish	.89			Read 2 Time	.39
Pronunciation	.54					Read 2 Words	.28
Free Or P.	48					Read 2 Error	.78
						Read 3 Time	.58
						Read 3 Words	.50
						Read 3 Error	.86

Table 6. Cannonical correlation: an example of the full data obtained: The language by adjustment domains

Statistical demands Variables1-4 n = 3 N = 802
5,6 n = 1
19-22 n = 2

Canonical R (RC)	% variance in common between sets	X	df	p	Roots removed
.31	9.5	104.44	24	$p < 0.1$	0
.14	1.9	23.31	15	$p < 0.5$	1
.09	.9	10.21	8	-	2

Looking at Table 6, we find that the Rc is only slightly increased in the cases of Language, Oral Reading , and Non-verbal Cognition by the Socio-Emotional domain. Thus, the previously found averaged simple, very low correlations are confirmed. However, the Language by Cognition and Language by Reading Rc coefficients are considerably larger than the simple correlations, and Reading by Cognition is substantially larger.

Table 7. A summary of cannonical correlations and averaged Pearson correlations between domains of variables.

Domains (sets of variables)	r	Canonical Rc
Language by Soc.-Emot. Adjm.	.19	.31
Oral Reading by Soc.-Emot. Adjm.	.12	.25
Nonv. Intell. by Soc.-Emot. Adjm.	.11	.24
Language by Reading	.38	.78
Language by Intelligence	.26	.69
Reading by Intelligence	.18	.46

In multivariate analyses, data matrices must be full (i.e. no missing data). To accomplish this, missing data were replaced with regression estimates from other tests for certain individuals. Data completion was done at two levels, one with harsher demands on original data. As this in a few cases meant very small groups, only the results for the more lenient demand, i.e. the larger groups, are reported in this paper. The reader is referred to Ekstrand, 1994a, for a full report.

In only two cases are the redundancies substantially different: They are larger for Non-verbal Intelligence against Oral Reading as well as Language. Although this is no proof, at best a slight indication, it may be that cognition contributes more to language than vice versa.

4. Discussion and Conclusion

4.1. General observations on the association between language, cognition, and affection

With the canonical correlation technique that optimizes the association between domains of variables, all the unanimous findings in the literature are confirmed: there is virtually no correlation between Affective measurements on the one hand, and Cognitive or Language measurements on the other. The small amount of correlation that is sometimes found is almost certainly due to the fact that completely uncontaminated measurements are rare. There is mostly a tangible cognitive component in attitude scales, ratings of affective aspects, and other measurements. Looking at the measurements in the literature, there is a tendency that purer affective measurements yield lower correlations than the cognitively contaminated ones.

On the other hand, there is a very strong correlation between Oral Reading and Language. It was thought that Reading to a great extent is a function of perceptual and motor skills. However, in spite of the technical nature of Reading, it appears to be an important aspect of language functions.

There is also a very strong correlation between Language and Non-verbal Cognition that may seem remarkable. Further, there is a fair correlation between Reading and Non-verbal Cognition.

Thus, the data show that language and non-verbal intelligence have a great deal of variance in common. In other words, the cognitive-linguistic components are all strongly integrated, even non-verbal cognition.As indicated by the redundancy values, see Ekstrand (1994a), non-verbal intelligence may contribute more to language than vice versa. Such an assumption needs further corroboration, however. As far as this finding goes, it is consistent with the Piaget (1962)and Vygotsky (1952) position that concept formation is primary to language, although the development is integrated. It does not seem to be consistent with Luria's previous position that language leads concept formation and behavior. Luria later (1975) completely reversed his position to agree with Vygotsky and Piaget.Due caution should be exercised in interpreting the data on this point, as they do not allow any far-reaching conclusions.

The data on language and cognition seem to support the observations of many authors, such as Lorenz and Porzig (reviewed in Ekstrand 1978a) regarding the important contribution that nonverbal intelligence makes to language. Language is constantly using physical and spatial analogies, and seems in fact to play a major part in translating the physical world to the mind. More recently, Ingvar (1983) reviewed neurological data. They revealed that there are many more language areas in the brain than the classic Wernicke's, Broca's and Penfield's areas. Especially the frontal areas are involved. This indicates a more widespread language integration with other brain functions than previously believed. Petersen (1983) found that immigrant college students (secondary high school) in Sweden did in fact better than indigenous Swedish students when SES was controlled. However, students on the Science and Technology options did somewhat less well than students in the Social Science and Humanistic (language) options, in spite of higher requirements for admission. One might have assumed that studying in a weaker language might have interfered more in the latter options, being assumedly more language dependent. However, as our present data as well as those of Ingvar (1983) suggest, nonverbal functioning is highly integrated with verbal. Thus, poor or incomplete concept formation may have disrupted the abstract thinking in the immigrant students in Science oriented options slightly more than in other options.

What the analyses do suggest is that the old discussion on language versus cognition may be approached with quantitative, multivariate techniques. Also, other measures may be developed and applied.

If there is no or almost no statistical relationship, there cannot be any causal relationship. This means that generalizations, type "not knowing L2 will cause emotional disturbances",or "not maintaining L1will cause emotional problems", or conversely, "improved L1 (L2) can prevent or cure emotional and social disturbances", cannot be valid. An explanation for the persistency of such generalizations will be attempted later.

Regarding the controversial discussion of cognitive primacy versus relative independence of affective and cognitive-language functions, the present findings of a weak or no

association seem to support Zajonc's position of relative independence, and weaken Lazarus' position.

4.2. Possible explanations for the lack of correlation

The lack of systematic correlation between affection and language, and affection and cognition, is not as remarkable as some might believe. There are many different reasons why a strong correlation cannot exist.

Firstly, one apparent reason is the *transitional nature of emotions*. With the exception of a few lasting states, such as grave depression, emotions may normally last for seconds, minutes, or, at the most, a few hours, provided that the condition inducing the emotion still exists and exerts influence. Although there are also shortlived cognitive processes, such as insight, associations, flashes of ideas, etc., many basic cognitive elements last for many years, perhaps throughout life, with relatively minor modification: basic intelligence, language, academic skills such as writing, reading, arithmetics, etc.

Secondly, it must be understood that the lack of statistical correlation between Language and Affection does not mean that there is no correspondence between cognition and affection, but that it takes another form. The correspondence must be thought of as an *interaction*, i.e. as different from *correlation*. It is easy to arouse emotions verbally: I can make my wife happy, sad or angry with words, I can have a group of students mad or enthusiastic with words, and so on. However, as mentioned, these affective states are mostly *transitory*. Hence, no stable correlation can actually be expected.

Thirdly, the same or a similar event, situation, person, etc. may give rise to different emotions from time to time, *depending on changed circumstances*: my joy over the arrival of a dear relative may turn into disappointment if the visit is delayed; a quarrel with my loved one may turn my love to anger, that again will turn to sweet love upon reconciliation.

Fourth, *differences in personality and temperament* may induce very different reactions in different individuals to the same type of situation.Research is plentiful, e. g. Blascovich (1990). The shy, introverted immigrant student may react with silence to the new surroundings, whereas the extroverted, expansive type will try to communicate, perhaps quite vividly, with a very limited supply of linguistic tools.

Fifth,the same event may give rise to different emotions in the same person, depending on the *conditions within that person*, such as state of health, fatigue, etc. Flying may be experienced as stimulating or relaxing when one is well rested, but may induce apprehensions when one is tired.

Sixth, the same event, condition, etc. may have very different emotional associations for different individuals, depending on their *previous experiences*. The word "mother" may have a very positive emotional loading to most persons, but may be very negative to some who have had a bad relation with their mother, lost her, etc.

Seven,there is a relative *neurological independence* of emotion and cognition. The fact that emotion and cognition are different events, processed differentially by different but co-ordinated brain mechanisms, is central for the issue. This means that the characteristics of cognition and emotion are so different (e. g. differences in expression, duration, degree and nature of physiological concomitants, etc.), that a high degree of correlation should not be expected (see 4.4).

4.3. The present data and a possible critical period

The lack of correlation and all the unsystematic variation makes it very hard to believe that emotional learning blocks would be such a stable variable as to constitute the basis for a *universal critical period for L1 or L2 learning*. The theories about this, and the empirical evidence against such an assunption have been discussed in detail in Ekstrand (1979, 1981).

4.4. Explaining the confusion between language and emotion in the debate on bilingualism

Why do so many authors claim that language has causal effects on emotional adjustment, and what could be the reasons for this belief? The answer seems to lie in the existence of an invisible *chain of conditioning mechanisms* between language and some event that originally triggered an emotional response. In childhood, a situation or event occurs, giving rise to some emotion. Learning mechanisms in the brain have been discussed i. a. by Penfield/Roberts (1959) and have later been explored in detail by Mishkin/Appenzeller (1987). First, an emotional response becomes attached to an event.During repeated experiences of the same kind of event, language also becomes attached to the event and the situation in which an emotion is experienced, and thereby to the emotion, directly or because of later consequences. The situation or event will form a specific memory or concept, to which the linguistic expression as well as the emotion become attached. The usual mechanisms of conditioned reactions operate processed via the limbic brain circuits. The linguistic expression may later *trigger the memory or concept that it represents,as well as the attached emotion*.Superficially, it appears as if language triggers the emotion directly.

4.5. A theoretical perspective

The implicit models for the cognitivists and the emotionalist schools of thinking in the debate are (a) the cognitivist view: perception and/or cognition always comes first, followed by emotion; (b) the emotionalist view: although cognition may often be primary, emotion may be prior to, simultaneous with, subsequent to, or relatively independent of cognition. Whereas the second model is more comprehensive and flexible, both models assume that there are only two domains of behavior: Cognition and Emotion. Certain facts are, however, overlooked in the debate.

Firstly, there are very often *chains* of reactions: A situation may give rise to emotions, which in turn will produce verbal or cognitive reactions, or direct action. Some basic types of chain are (a) perception - emotion - thinking/action; (b) perception - cognition - emotion - action; (c)emotion - thinking/action; (d) emotion - perception - thinking/action; (e) emotion - action; (f) emotion - thinking. The chains c-f will be contingent on whether instances of emotional primacy can be demonstrated or not.

Secondly, regarding relative independence, the present results on the group/individual level strongly agree with the position of Zajonc. What may be wrong, if anything, with the cognitivist view? Much of the argumentation of Lazarus' and others is built on four assumptions: (a) that emotions cannot give rise to perceptions or cognition; (b) that perception/cognition always precedes emotion; (c) that perception cannot be parallel to, or simultaneous with emotion; (d) that perception is part of the cognitive domain.

Looking at the last assumption, if behavior and brain mechanisms shall at all be looked at differentially, the division into only two realms of behavior is suspect. We may differentiate between at least five major domains of behavior, each with specific (although coordinated) neural substrata: perception, cognition, emotion, volition, and action.

Moreover, cognition should further be analyzed into different types of processes: thinking, language, imagery, fantasy, creativity, logical operations, etc.

Perception my be regarded as a basic, independent process, as a domain by itself, as Gibson's ecological theory of perception states.Gibson (1979) points out that there is often enough information in what is being perceived without a need for subsequent cognitive analysis in order to interpret what has been perceived. Further, one might ask what is cognitive in the perception of hunger, thirst, pain, and the proprioceptive and kinetic senses. A hungry individual eats, i.e. acts without cognitive consideration. Even a newborn baby sucks when hungry and offered a nipple, due to direct reflex paths. It seems, mildly put, exaggerated to regard such reflex action as cognition.

Sokolov (1963) carefully studied the physiological events involved in perception. When a stimulus is received via the sense organs, a number of simultaneous events of arousal occur, in the brain itself, or mediated by the brain: suppression of alpha rhythms in the brain, changes in blood pressure, heart rate, pupil size, peripheral and central vasoconstriction/dilution, change of skin temperature, etc. The arousal is simultaneously accompanied by emotion. These changes are brought about via the ANS, which has direct fibres to the cerebral cortex. The changes take place immediately, even before the subject becomes conscious of the change in conditions.

Mishkin/Appenzeller (1987) have followed the brain's processing of sensory events, from the primary reception areas to higher stations where concepts are being formed.There is a continuous development from sensation to concept. Central for laying down memories are the amygdala and hippocampus in the limbic system, which can substitute for each other regarding features of objects, whereas the hippocampus processes spatial relations between

objects. The amygdala has direct, extensive connections with all the sensory cortical systems. It also has direct fiber connections with the hypothalamus, the source of emotional responses.

Some of their conclusions are highly pertinent to the debate on the primacy of cognition and affection:

> "It is possible that the amygdala not only enables sensory events to develop emotional associations, but also enables emotions to shape perception and the storage of memories. Together, the evidence suggests the possibility that opiate-containing fibers run from the amygdala to the sensory systems, where they may serve a gate-keeping function by releasing opiates in response to emotional states generated in the hypothalamus. In that way the amygdala may enable the emotions to influence what is perceived and learned." (Mishkin/Appenzeller 1987: 70)

Thus, three out of the cognitivist four assumptions seem invalid: emotions can give rise to perceptions or cognition;perception may well be parallel to, or simultaneous with emotion; sensation and at least the early stages of perception should not be regarded as part of the cognitive domain. What about the possibility that emotion may actually precede and trigger cognition, perception, or volition? In fact, positive proof for emotions inducing and structuring cognition can be found.

4.6. Examples of feelings inducing and structuring cognition and action

As is common text book knowledge, endocrine functions play a major role in regulating emotions. Among many existing examples, a few only are selected here. The reader is referred to Netter (1965 a,b, 1967) whose medical illustrations are unsurpassed in giving the anatomical, physiological, functional and psychological characteristics of the nervous, endocrine and reproductive systems.

Certain kinds of depression may be induced or increased through melatonin, the "sleeping" hormone produced by the light sensitive pineal gland (Netter 1965b, Wetterberg, 1986, pers. comm. 1989, Kuller 1987). It also produces "stress hormones" (cortisoids and stereoids) that keep us awake during the light hours.Melatonin induced depressions are now cured through light therapy, a couple of hours 2-3 times a week (Wetterberg, 1986; Kuller, 1987: St. Göran's Hospital in Stockholm, personal communication). Thus, the outlook and conclusions about the world, i.e. the cognitive processing, and certainly the linguistic expression, are structured by hormonal activity.

The gonadotropic or "sex" hormones affect behavior, not only sexually, but in a variety of ways.Three of the hypophysis hormones have gonadal functions in the female, viz. the FSH (Follicle Stimulating Hormone), the LTH (Luteotropin or Prolactin), and the LH (Luteinizing Hormone) which is identical with the ICSH (Interstial-Cell-Stimulating Hormone) in the male. The ratio of these hormones vary with age, workload, stress, and in women, with the menstrual cycle. FSH stimulates the first part of this cycle, and LH stimulates ovulation and other processes. LH controls the production of estrogen and progesterone, the

latter becoming enhanced just before ovulation, and contributing to sex urge. Prolactin is present during the later part of the menstrual cycle. In the male, testosterone provides the sex urge or libido.The female emotional reactions (affection, joy, anger, irritation, etc.) to similar events may be very different before and after ovulation. Male sexual and parasexual interest and behavior, as well as the evaluation of the opposite sex,changes with the level of testosterone in the blood.

Perceptions, for instance of the attractiveness of a person of the opposite sex, cognitive acts such as sexual fantasies, and the initiation of sexual action are primarily determined by the hormonal situation.Further, sexual interest is mostly accompanied by feelings of tenderness, care, deep affection, etc. Thus, a whole range of moods and consequential cognition and action (e. g. writing love letters) are to a large extent hormonally induced.

A third example is thyroid disturbances, which may cause nervousness and anxiety (Netter 1965b), similar to what may also be caused by troublesome external conditions. Again, in the case of thyroid disturbance, the feelings are there first, and cognitive reactions are induced by them.

Some trivial examples are feeling hungry, thirsty, itchy, warm, cold, etc. which will led to actions of finding and taking food and drink, scratching, or seeking a cold or warm environment. The cognitivists would argue that the feelings have to be perceived, but I maintain that they are all basically reflex actions, i.e. people do not have to *learn* them. Sometimes, action will be taken via reflex arcs without conscious perception or even sensation. If the cognitivists will argue that unconscious sensation is equal to cognition, their position seems weak indeed.

Finally, the hypophysis produces the hormone ACTH which triggers the production of adrenaline and noradrenaline in the suprarenal glands (Netter, 1967). Adrenaline is instrumental in arousal processes such as anger, fear, joy, general arousal, etc. The suprarenal glands are also innervated by the ANS, so the hypophysis exerts a dual effect on them. Some persons have a balanced temperament, not being easily aroused. Other persons will react quickly and strongly, and perhaps very differently to the same events. The cognitivist view is unable to explain intra- and interpersonal differential reactions.

There are also other, complex problems of partly emotional, partly cognitive nature in interaction, as in the case of anorexia nervosa, where an identity conflict leads to self-starvation that in turn will affect gonadal and other hormone production, that will in turn affect cognition (cf. the discussion on behavioral chains above).

In the examples given above, hormonal effects, via emotions, *structure cognition*, not vice versa. Thus the picture is much more multi-faceted and nuanced than the cognitivist view would lead us to believe. As shown by our examples, hormonal-affective influences on cognition are frequent events.

4.6. Conclusions

1. The quantitative association between the domains of language and cognition is substantial and higher than might perhaps have been expected.
2. In spite of a strong association between language and cognition, mother tongue preservation does not seem to promote cognitive and linguistic progress, but rather slows it down.
3. There is no evidence for a causal, disruptive influence on affective factors from learning a second language. This was indicated already in Ekstrand (1976a,b). In Sweden, as mentioned, immigrant students tend to do even better than indigenous students when SES is controlled, provided proficiency in Swedish is adequate.
4. Oral reading seems to be a substantial, integrated part of language.
5. There is a very low, negligible association between the domains of cognition and of socio-emotional adjustment.
6. There is a very low, negligible association between language measures and measures of socio-emotional adjustment.
7. There is no clear indication of cognitive primacy over affective factors. However, the design of the study does not really allow firm conclusions regarding this issue.
8. There are strong indications of relative independence between cognitive/language and affective factors. The lack of correlation, as well as the theoretical discussion strongly suggest such an independence.
9. There is no evidence for affective primacy over cognitive/language factors in the reanalysis data, but there are strong indications in the discussion of hormonal and neural influences. Although there may often, perhaps mostly, be a cognitive primacy, there are important and not infrequent exceptions.

The multivariate analyses presented are an attempt to test, in a quantitative manner, assumptions about the relations between affection,language and cognition.The over-all pattern is clear enough: in combinations of language by reading, reading by intelligence and language by intelligence, Rc increases substantially in comparison to r. In contrast, this increase is very limited in all combinations with affection.

Combining results from various areas, adjacent to psychology, with the multivariate analyses,we find a strong support for the relative independence of perception, cognition, and emotion, a further explanation why systematic correlations between affective and cognitive data cannot be expected.

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