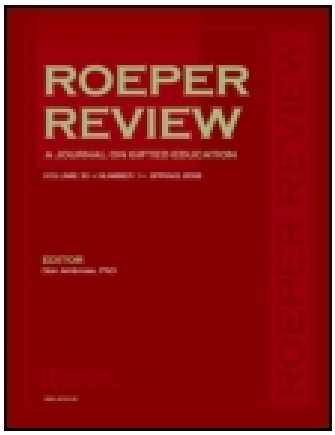

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Selected results of the Munich longitudinal study of giftedness: The multidimensional/typological giftedness model

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Selected Results of the Munich Longitudinal Study of Giftedness: The Multidimensional/Typological Giftedness Model*

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The Munich Longitudinal Study of Giftedness (carried out from 1985 to 1989), the most comprehensive giftedness study ever conducted in Germany, covers six cohorts at three points of measurement In this article, the study's multidimensional and typographical conception of giftedness is explained After a short overview, results concerning the validation of the multidimensional giftedness model as well as attempts to establish a giftedness typology are presented While the multidimensional model proved to be useful for predicting achievement behavior, the typological attempts failed. Finally, it is demonstrated that intelligent and creatively gifted students differ strongly in their achievement behavior. Consequences for fostering the gifted, especially the creatives, in school are discussed

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From 1985 to 1988 an educational-psychological research project, the "Munich Longitudinal Study of Giftedness" (Heller, 1991, 1992; Heller & Hany, 1986) was carried out at the University of Munich (financed by the German Federal Ministry of Education and Science, Bonn (B 3570.00 B). Data from gifted students were collected in three waves from 1986 to 1988 starting with a large multi-regional sample of 26,000 students in six cohorts. In 1989, a replication study was begun in Moscow by a team of psychologists at the Russian Academy of Pedagogical Sciences under the leadership of Prof. Dr. A.M. Matyushkin (c.f. Averina, Sheblanova & Perleth, 1991; Perleth, Averina & Sheblanova, 1992). A data collection point for the German sample is planned for 1993. This article presents a short overview of the study and focuses on research related to the underlying model of giftedness.

Multidimensional/Typological Approach to Giftedness

"Giftedness" can be defined as the sum of the individual's (cognitive, motivational) potential and sociocultural conditions for learning and achieving (Roth, 1986). The development of giftedness is understood as the interaction of internal (personal) dispositional factors and external socialization factors. Different conceptualizations of giftedness are related to different research paradigms: (a) nomothetically oriented psychometric studies that attempt to measure quantitative inter- and -intraindividual differences in ability, (b) idiographically oriented information-processing approaches in modern research on problem solving that try to determine qualitative components of thinking processes, and (c) giftedness in the sense of psychological aptitude. Here giftedness is considered to be a person's disposition or characteristic profile with regard to learning or achieving demands (i.e. school, university or career planning).

Although in more recent research on giftedness, cognitive psychological approaches have been favored over psychometric research approaches, both research paradigms contribute in their specific way to an understanding of giftedness. We continue to consider psychometric results when predicting achievement and success. Diagnoses of giftedness thus can serve an important function in personality nurturance, for example, in individual developmental counseling, or intervention (cf. Heller, 1987, 1989).

Modern educational psychology emphasizes the necessity of differential curricula and school environments specific to types of giftedness (e.g. Feldhusen, 1985; Gallagher, 1985; Tannenbaum, 1983). It is assumed that there are different forms of giftedness that can be categorized according to specific behavior and achievement areas. For example, exceptional achievement in a foreign language or in mathematics may be attributed to a person's corresponding verbal or quantitative abilities. At the same time, motivational and sociocultural causal factors can be more or less involved in the manifestation of achievement. Clearly, every concept of giftedness also includes the use of relatively complex behavioral phenomena (cf. Hany, 1987; Heller, 1989; Mcleod & Cropley, 1989; Sternberg, 1990). Examples are Gardner's (1983) model or the multidimensional model which underlies the Munich Longitudinal Study of Giftedness.

Gagné (1985), who also favors a multidimensional model, differentiates between general and specific gifts on the dispositional side and domain-specific talent forms on the behavior or achievement side. The assumption of mediating factors (referred to as catalysts by Gagné) is also interesting (e.g. personality factors such as motives, interests, or attitudes, and socialization factors such as family and school). Heller, Rosemann, & Steffens (1978) have introduced so-called moderators as mediating variables for the explanation of predictor-criterion relationships in their prognostic study of school career counseling which focused on enrollment in special school programs.

Considering this, we defined *giftedness* as the individual's cognitive, motivational, and social possibilities of attaining ex-

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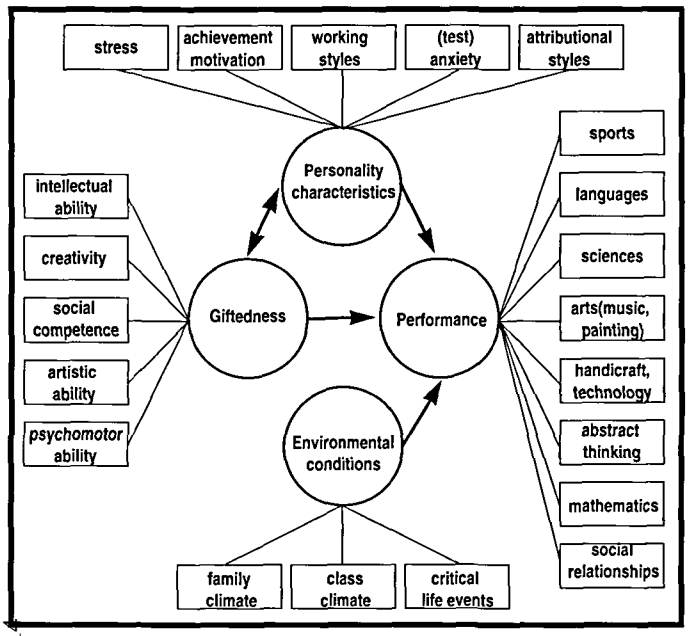

Figure 1: Giftedness model of the Munich Longitudinal Study of Giftedness

ellence in one or more areas (Figure 1). Thus a multidimensional concept of giftedness was used in the Munich Giftedness Study in which achievement behavior is seen as the product of the predictors giftedness, personality, and environment:

Giftedness is investigated in the areas of intellect, creativity, social competence, Artistic (musical) ability, and psychomotor ability.

The five dimensions of giftedness correspond to areas of academic and non-academic achievement.

In addition to cognitive abilities, non-cognitive personality characteristics (including motivational variables, interests, working and learning styles) are involved.

Socialization factors include family and school climate and critical life events.

Not all giftedness researchers prefer a multidimensional approach. In Germany, for example, there was a debate on this issue between Hany & Heller (1991) and Rost(1991a, 1991b). While Hany & Heller (1991) argued for the multidimensional Munich model, Rost (1991b) favored from the practical point of view, the use of a Spearman-like "general intelligence" (1927) for the identification of the gifted. Rost who directs another giftedness study of major importance in Germany (the Marburg Giftedness Study, see Rost, 1993) argues that gifted dimensions such as creativity or social competence cannot be investigated with reliable and valid methods. Although Rost's (1991b) arguments have been strongly criticized by Hany & Heller (1991) and Mönks (1991), general intelligence continues to predominate in the literature as the primary operationalization of giftedness.

The Munich Giftedness Study, on the other hand, was based on a multidimensional giftedness model and intended to establish a typology of giftedness. The multidimensional approach postulates different, more or less independent dimensions of giftedness. The typological approach (e.g., Rosemann, 1978) tries to identify giftedness types, permitting the discovering of possible qualitative differences between gifted and average students using a quantitative methodology, and a classification of the gifted on the basis of empiracal data. Such a typology would provide an empirical basis for curricula or methods for counseling and guiding the gifted. A recent inquiry in PsycLit and Psyndex (German database) showed that our typological approach is unique in the field of giftedness. For example, none of the research tried to find a giftedness typology on test data.

Overview of Results of the Munich Longitudinal Study of Giftedness

A short overview on important aspects and results of the Munich Giftedness Study will provide an impression for the broad data base and the many different facets of the study. The first phase of the study (wave 1) was dedicated to questions of identification and the validity of the giftedness model used. The goals of this identification phase (1986-1987) were; a) the development and evaluation of battery of tests and questionnaires for the identification of gifted students; b) testing aspects of the giftedness model underlying the study, particularly the independence of the domains of giftedness under investigation; c) analysis of the typological structure of the sample, especially identifying possible types of gifted students in different age groups; and d) the selection of the most gifted students for the longitudinal study (waves 2 and 3).

Major results from this first phase of the study are summarized as following (for more details see Hany, 1987, 1992; Heller, Perleth & Sierwald, 1990; Heller, 1990, 1991). The instruments used to measure cognitive and noncognitive (especially motivational) dimensions of the gifted, together with relevant conditions of the social learning environment, were sufficiently reliable (see Heller, 1986). The five factors of the Munich Longitudinal Study of Giftedness (intelligence, creativity, psychomotor ability/practical intelligence, social competence, musical ability) proved to be independent dimensions of giftedness, confirming the hypothesis of domain-specific forms of giftedness. Significant differences were found between the highly gifted and average students in each domain of giftedness and among the various types of giftedness. For example, the intellectually (or academically) gifted had better school grades than the rest of the sample. The creative students were in some aspects more active and more successful in artistic and literary areas, and the socially gifted in social areas. Multiple or many-sided gifted were found relatively infrequently in the sample. If, however, one views those students (from ages 6 to 16 or 18 years) who were both highly intellectually and creatively talented, one sees that they were superior to all of the other students in important performance areas. From the methodological point of view, this finding is not too surprising, but does underline the point that the diagnosis of giftedness should not continue along single dimensions. Particularly capable students differed positively from the others in personality characteristics (here: different motivational variables).

Research conducted to establish a typology of giftedness was less successful: No clear types of giftedness could be found in the preselected sample (containing the best 30% of the population on the basis of teacher nomination. That means that the cluster analysis did not discover groups of gifted students with special configuration of giftedness. As a main result, both for practical purposes and with regards to our research, a multidimensional cut-off for the longitudinal sample of the study (see below) best optimized the different constraints (simplicity, practicability, effectiveness, efficiency; see Hany, 1992).

In the second (longitudinal) phase of the project, developmental and achievement analyses were the focus of the study.

Essential goals of this second phase were: a) the evaluation of the predictive validity of instruments employed during the first (1986), second (1987), and third (1988) measurement periods for identifying gifted students; b) the longitudinal evaluation of the validity of the typological concept of giftedness and relationships between various types of giftedness and performance; c) the evaluation of the effects of personality and environmental factors on the performance of gifted students over time; d) description and analysis of the developmental course of gifted children and adolescents in relation to changes in cognitive and noncognitive characteristics; and e) the analysis of the interaction between giftedness, achievement, personality, and environment.

In the limited frame of this article we can only give a brief survey of some important results of these general research goals. We will therefore concentrate on longitudinal analyses concerned with the underlying multidimensional and typological conception of giftedness in secondary school students (grade 7–9 and 9–11). For more information about results of the study see the complete research report by Heller (1992; in German language), Heller (1991) or Perleth & Heller (1993).

Research Questions

In the first phase of the study, the multidimensional giftedness model of the study was confirmed by the data, e. g. by the finding that domain specific giftedness tests correlated best with corresponding domain specific achievement. Instead of investigating the concurrent validity of the tests, we now analyze their predictive validity.

Are domain specific giftedness tests best able to predict achievement in respective areas?

The typological approach during the first phase of the study produced equivocal results. As these analyses were conducted with the whole sample of wave 1 and not with the selected longitudinal sample, we made another attempt to find a giftedness typology.

As it was not possible to identify special types of giftedness by cluster analysis (k-way method, see Wisehard, 1984), the hypothesis arose that gifted students show such highly individual structures of giftedness that they differ from normal students in the very fact that they cannot be grouped at all. Typological analyses always try to discover homogeneous groups of cases, not cases with individual configurations. To clarify this question we applied – before a k-way cluster analysis – Bergman's (1987) program to the longitudinal data to identify possible "singular types" of giftedness (Bergman's method tried to separate the possibly clusterable part of a sample from the non-clusterable residuum) and get a reasonable typology from the rest of the data.

Can we establish a giftedness typology after identifying non-clusterable cases and are the types and the non-clusterable cases stable over the measurement points?

Finally, as a validation of a very simple typology with focus on creativity and intelligence groups, we investigated

Whether groups of stable highly creative and intelligent students in comparison with average students (as a very simple typology) obtain different academic and non-academic achievement and whether they vary in their development of achievement over the measurement points.

In this article we present results to the above questions for only two of the cohorts, namely for those students who moved from grades 7–9 and 9–11 during the study.

Design, Sample, and Method of the Study

Figure 2 shows the complete sample design as planned by Heller & Hany (1986). The numbers in brackets indicate the actual numbers of participants in the three waves. A planned data collection point is pictured in the dotted boxes at the end of the shaded arrows. The numbers indicate the number of students who voluntarily gave us their addresses and who were willing to answer additional questionnaires.

Bearing the "bandwidth-fidelity-dilemma" in mind, (Cronbach & Gleser, 1965: psychological tests cannot simultaneously measure a broad variety of characteristics with high precision) a two-step identification process was used in the first phase of the study as proposed by Heller & Hany (1986). First, teachers were asked to nominate the most gifted students from their classes on a check list that covered the five dimensions of the study's giftedness model (Fall 1985). Approximately 30% of the entire sample of about 26,000 students were preselected on the basis of these ratings. Second, the preselected 30% of the original sample were administered aptitude tests and questionnaires (wave 1 in Spring/Summer 1986) to find the top 10% of the preselected sample in the intellectual, creative, social, psychomotor, and musical domain of giftedness for the longitudinal sample. This way, these top 10% of the preselected students should correspond in each giftedness domain to the top 2–5% of the population. In addition, the top 10% of the preselected sample with the highest academic (main subjects) and nonacademic achievements (literature/art, social, musical, and sports activities) were selected out of the preselected sample.

The longitudinal sample selected by this 2-step procedure was administered tests and questionnaires at two more measurement points in Spring/Summer 1987 and 1988. As a result

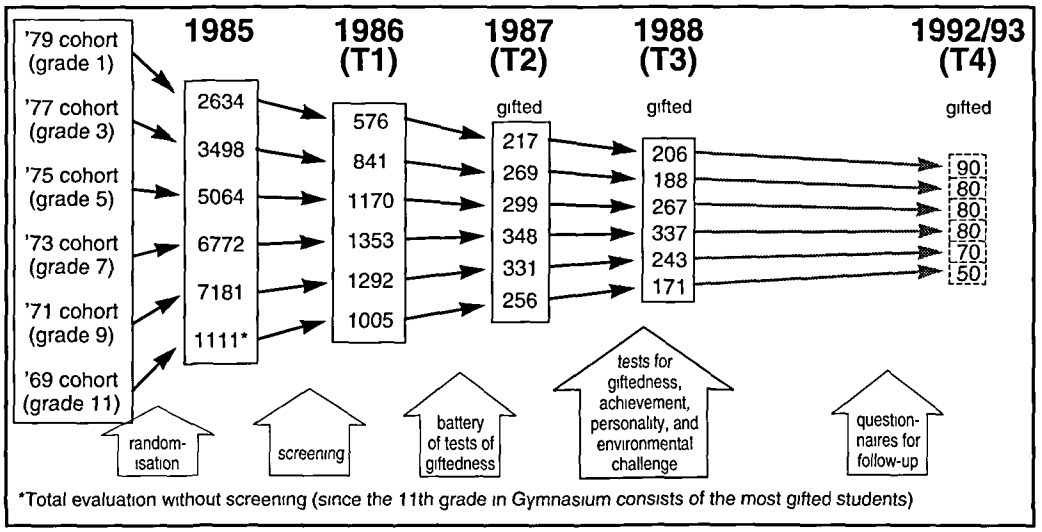

Figure 2: Sample design of the Munich Longitudinal Study of Giftedness

of the 2-step selection procedure, the best 30% in each domain of giftedness (e.g., intelligence, creativity) of the longitudinal sample correspond to the top 2-5% of the population. See Perleth (1992) or Perleth & Heller (1993) for more details on the sample and the methodology of the study (including tests and questionnaires used).

The results presented in this article are based on the participants in the longitudinal study of the two cohorts who moved from grade 7 and grade 9. They are referred to as the 7th (about N= 381, 342, and 330 at waves 1, 2, and 3) and 9th (N= 349, 331, 240 at waves 1, 2, and 3) graders. As students moved to different German school types (ending after grade 9, 10, and 13), we will report only results for the Grammar school students (7th graders: N= 271, 248, 235 at waves 1, 2, and 3; 9th graders: N= 287, 268, 239 at waves 1, 2, and 3). Because of missing data (especially in achievement variables), we will give the number of cases in the tables of the result-section. Stable creative and stable intelligent students (question 3) were those who belonged to the top 30% in creativity (Uses test) and intelligence (CAT-Total score) in the longitudinal sample at wave 1 and wave 3 (these 30% correspond to the top 2–5% of the population). Average students were those who did not belong to the top 30% at wave 1 or at wave 3.

The following tests were used for the analyses presented in this article:

- German Cognitive Abilities Tests (Heller, Gaedike & Weinläder, 1985) referred to as CAT-V (verbal score), CAT-Q (quantitative score), CAT-N (nonverbal score), and CAT-Total (total score);
- Facaoaru's (1985) version of the Unusual Uses test (scores: number of produced categories, referred to as Uses test);
- One subtest of the Verbal Creativity Test (Schoppe, 1975; referred to as VCT), where students had to produce four-word-sentences using four given letters as starting letters of the words;
- A questionnaire of social competence developed by project coworkers on the basis of older German questionnaires (reliability on the basis of the Kuder-Richardson formula 20: KR20=.84);
- The German version of the GIFFI (Rimm & Davis, 1980);
- Academic Achievements: school marks in German, English, Mathematics, Arts, and Music;
- For non-academic achievements and leisure time activities the following scales of the Munich Activities Inventory (MAI, developed by coworkers of the project on the basis of older American and German inventories) were used: Science (KR20= .81), and Music (KR20= .81).

Developmental analyses investigated interindividual differences (at each time of measurement) and interindividual differences in interindividual differences in interindividual changes (changes of relative position of individuals; see Schneider, 1989).

Results

Validation of the giftedness model: Predictive validity of the giftedness tests

Tables 1a and 1b contain the correlations between selected giftedness variables (measured at wave 1) and variables of academic and non-academic achievement for both cohorts of 7th and 9th graders. We included only those correlations which were significant at the 5%-level, numbers in brackets indicating the number of cases each coefficient is based on.

Results concerning the typological concept of giftedness

Data from 406 students from both analyzed cohorts (wave 1 and 3) could be included in the typological analysis on the basis of the standardized scores of the CAT, the VCT, the Uses test, and the Social-Competence-questionnaire. Analysis began with Bergman's (1987) MPREP-program (with distance-parameter .5) to identify possible singular types of giftedness. The program assigns every case to the residuum whose Euclidean

Predictive validity of selected giftedness tests for 7th graders

	Academic achievement				Non-academic achievement and activities					
	German	English	Maths	Music	Arts	Science	Literature	Arts	Music	Social
CAT-V	.4269 (186)	.4658 (186)	.2502 (186)				.2322 (160)			
CAT-Q	.1208 (186)	.1501 (186)	.3358 (186)					-.1589 (162)		
CAT-N	.1386 (186)	.1974 (186)	.2841 (186)							-.1494 (160)
CAT-Total	.2853 (186)	.3466 (186)	.3931 (186)							
Uses Test	.1629 (186)	.2284 (186)			.1327 (184)	.1989 (160)		.1570 (162)		
VCT				.2079 (177)		-.1681 (160)				
GIFFI	.1292 (165)				.2172 (164)		.4480 (143)	.4112 (145)	.4217 (128)	.4621 (143
Social Competence				.1500 (171)			.2806 (154)	.1392 (155)	.2620 (136)	.4050 (153)

Table 1a

Predictive validity of selected giftedness tests for 9th graders

	Academic achievement				Non-academic achievement and activities					
	German	English	Maths	Music	Arts	Science	Literature	Arts	Music	Social
CAT-V		.2389 (179)				.1439 (153)	.1350 (154)			
CAT-Q	.1369 (179)	.1688 (179)	.3662 (179)			.3390 (153)		-.1782 (156)		
CAT-N	.1055 (179)	.1020 (179)	.2653 (179)							
CAT-Total	.1494 (179)	.2072 (179)	.2957 (179)			.2443 (153)				
Uses Test	.1513 (173)				.2641 (167)		.2111 (153)	.1552 (155)		.2252 (155)
VCT				-.1737 (166)			.1836 (146)			.1587 (148)
GIFFI	.1970 (162)			.1492 (158)	.2371 (156)		.4380 (137)	.4629 (139)	.1583 (117)	.4239 (139)
Social Competence		-.1510 (167)	-.1477 (167)	-.1370 (163)			.2425 (139)	.2363 (141)		.4088 (141)

Table 1b

distance in the space of characteristics to the next neighbor is larger than the square root of .5 (about .71). Such cases, for example, appear at the extremes of the distributions. In other contexts such cases are known as outliers. As can be seen from table 2, however, the residuum did not contain many gifted students but rather negative outliers. Even when inspecting the single cases we did not find gifted students within the residuum with the exception of seven cases with high creativity scores at wave 1.

Next we applied a k-means cluster analysis (e.g., Wisehard, 1984) to the cases not in the residuum trying to find a giftedness typology in the clusterable part of the sample. If a sample can properly be represented by a typology, a stepwise decreasing of the number of clusters should produce a constellation where the variance between the groups suddenly increases while within group variance declines. In our sample, however, such a "natural" grouping did not emerge. So we computed a solution with 6 clusters for the data of wave 1 and 3. The means of the resulting groups can be seen from table 3.

Comparing the cluster solutions for wave 1 and 3 yielded some basic similarities between them, leading us to analyze whether the cluster structure was stable from the 1st to the 3rd point of measurement. This was also suggested from results we had found from stability-reliability-analyses of the CAT and Uses test data using the LISREL structural-equation-approach with latent variables (Perleth & Sierwald, 1992) where these test results proved to measure quite stable traits. For the presented results, we used a loglinear analysis of the contingency table (e.g., Fox, 1984; Marascuilo & Busk, 1987) whose entries were the membership to one of the clusters or the residuum at wave 1 and wave 2. It was found that very different students belonged to the residuum at both measurement points. Thus, the hypothesis that gifted students belonged to the residuum at both measurement points. Thus, the hypothesis that gifted students with special giftedness configurations are

Means and (in brackets) standard deviations of the classification variables for the residual group

	Wave 1	Wave 2
CAT-V	-1.03 (1.78)	-1.16 (1.29)
CAT-Q	-.81 (1.19)	-.95 (1.06)
CAT-N	-1.42 (1.51)	-1.58 (1.76)
Uses Test	.38 (1.33)	-.60 (0.86)
VCT	.07 (1.70)	-.33 (1.42)
Social Competence	-.25 (0.96)	-.28 (1.41)
N (% of sample)	18 (4.4%)	15 (3.7%)

Table 2

Means of clusters (z-scores) for wave 1 and 3

Wave 1	CAT-V	CAT-Q	CAT-N	Uses	VCT	Soc. Comp.
Type 1	-.75	-.74	-1.44	-.03o	.02	.96*
Type 2	.52*	.86*	.26	.32	-1.70	-.12
Type 3	-.06	-.06	.20*	1.13	.76	.17
Type 4	-.77	-.76	-.40	-.13	-.33	-.87*
Type 5	.58	.07	.57*	-.63	.18	.76*
Type 6	.58	.95*	.70*	-.46	.23*	-.93*
Wave 3	**CAT-V**	**CAT-Q**	**CAT-N**	**Uses**	**VCT**	**Soc. Comp.**
Type 1	.41	-.12	.40*	-.83*	-.80*	-.46*
Type 2	.41	.50	.24*	-.60*	-.61	-1.81*
Type 3	-.49	-.71	-.89	.90*	.08*	.84*
Type 4	-1.06	-.99	-.95o	-.46*	-.26	-.33*
Type 5	.19	.45*	.44*	1.16*	1.13	.30*
Type 6	.53	.99	.63	-.12	.41	-.14

Legend: * = f - ratio < .5; o = f - ratio > .1;
Uses = Uses test; Soc.Comp. = Social competence.

Table 3

characterized by not belonging to the clusterable part of a sample must be rejected. Moreover, the clusters themselves also did not turn out to be stable over the course of the two years under investigation.

Development of achievement in the intelligent and creative

As no typology of gifted students could be established, we could only investigate academic and non-academic achievement of groups characterized by extreme values in single giftedness dimensions. When assigning the students to groups of stable creative (students who belonged to highest scorer in the Uses test in both wave 1 and 3; n= 23 and n= 28 in the cohorts of 7th and 9th graders), stable intelligent (highest CAT-scores in both wave 1 and 3; n= 56 and n= 49 in the cohorts of the 7th and 9th graders), and the average group (not in the most creative and intelligent group neither in wave 1 nor in wave 3; n= 45 and n= 59 in the cohorts of 7th and 9th graders) we found only four students in the cohort of the 7th graders and none in the older cohort who belonged to the stable intelligent and creative group. Because of missing data in the achievement scores, the number of cases is smaller in the results reported next.

Multiple analyses of variance confirmed that in the 7th graders the differences between the groups for academic and non-academic achievements and activities were significant for wave 1 and 3 (5%-level for all comparisons in this section), while univariate tests turned out to be significant for the school "main" subjects as English, German, and mathematics and for non-school science. Student-Newman-Keuls a posteriori tests for univariate analysis of variance showed that the significant superiority in German and mathematics of the intelligent students at wave 1 vanished at wave 3.

The situation in the older cohort is quite similar in academic achievement. The significant overall difference is caused by differences in German, English, and mathematics at wave 1 and mathematics and arts at wave 3. The significant difference between the intelligent and creative at wave 1 cannot be found at wave 3 where the creative are significantly superior to the intelligent in arts. In non-academic achievements we have to state that the creative scored significantly higher in literature, arts (significantly only at wave 1), and social activities. The better scores of the intelligent in comparison to the creative in science are not significant, the significant effects in this variable result to some extent from the lower values of the average students.

As the results and the descriptive statistics indicated, especially in the area of academic achievements, the superiority of the intelligent students diminishes with the course of time. We therefore computed repeated measure ANOVAs (multivariate and separately for each achievement variable) looking for significant time group interaction effects as a stronger evidence for this development. In the cohort of the 7th graders, we found a tendency ($p<.1$) for the respective overall effect while the univariate effect for the school marks in German turned out to be significant. In the older cohort (overall effect also significant) a tendency could be found for school marks in German ($p<.1$) and a significant effect for mathematics. In the older cohort of the 9th graders no group time interaction effects were significant.

Discussion

The first major result served as evidence for the validation of the giftedness model of the Munich Longitudinal Study of Giftedness. Although the coefficients are not very high, cognitive abilities best predict academic achievements and activities in spare time activities in spare time activities in science, while the creativity measures correlate with school marks in German, arts, and music as well as with non-academic achievements in literature, arts, music, and social activities. Social competence as measured with our questionnaire shows either no relationship or even a weak negative association with school marks and correlates highly with social activities outside school. Within the intelligence domain, the verbal CAT-scores tend to correlate highest with grades in German and English language while quantitative intelligence relates most closely to mathematics. The finding that only four students of the 7th graders belonged to both the stable intelligent and creative group underlines the relative independence of the giftedness dimensions under investigation.

Our attempts to establish a giftedness typology on the basis of our data were less successful. The residuum (the non-clusterable part of the sample) did not contain gifted students with special combinations of giftedness factors, nor was the membership in the residuum a stable characteristic. On the contrary, the residuum consisted mainly of less gifted students. The attempt to find a giftedness typology was similarly unsuccessful. Cluster analyses of the cases not in the residual group showed no clear types of giftedness. In addition, the resulting types were not stable from the 1st to the 3rd point of measurement. This means that the students belonged to different clusters at different measurement points even though the giftedness traits in the analysis had proven to be relatively stable in other analyses (not in this article).

In sums, the cluster analysis shows that, in our sample, there were no qualitative differences between gifted and average students which could be detected by the aid of our statistical tools. The students, rather, seemed distributed continuously along the dimensions of giftedness, the sample of the analyzed cohorts, therefore, being homogeneous and not divisible into clearly distinguishable groups. These findings again strengthen the hypothesis that the different giftedness domains are relatively independent. All in all, we could neither prove that the gifted are such individual cases with such individual configuration of giftedness dimensions that they cannot be grouped at all, nor find a stable typology or only a few stable clusters of especially gifted students. From our point of view, the typological approach does not seem to be a fruitful one for giftedness research.

Our procedure to investigate the data of two waves by cluster analysis and compare the members of the resulting clusters also helped to avoid misleading conclusions. If we had just presented the cluster analytic results of one point of measurement and if we had not checked the stability of our clusters - which can be taken as a crucial validation - we could have easily interpreted the result of one of the waves as a plausible and reasonable typology of giftedness. Only a critical view of research result , including analyses of stability, cross validation, and similar methods can prevent wrong conclusions from such exploratory data analysis tools as cluster analysis.

On the other hand, interesting information emerged about differences in the achievement behavior of stable intelligent and creative gifted, two independent groups among them very top students. First, the results show that the highly intelligent

students have advantages in school, especially in the major subjects of German, English, and mathematics. Outside school, the highly intelligent students differ only in more science-related activities. The creative gifted, on the other hand, turned out to be superior to the intelligent in arts, literature, and social activities, especially outside school. These results fit very closely to Siegler & Kotovsky's (1986) separation of the schoolhouse gifted and the creative productive. Bear also in mind that the investigated leisure time activities are - in contrast with the indicators of academic achievement - to a much stronger extent self controlled activities, even if family climate is a major influence. (Perleth & Sierwald, 1992).

The developmental outcomes are even more interesting. Comparing the cohorts under investigation from a cross-sectional point of view, the superiority of the creative in non-academic areas is especially obvious in the older students. Analyses of developmental effects in each of both cohorts showed that in the course of the two years under investigation, the intelligent students lose much of their advantage in the school such as German and mathematics, but also in English and science activities outside school while the creative hold or even tend to enlarge their superiority in the field of literature, arts and social activities. This is a remarkable result, all the more, as the used measure for creativity was based on only two items of the Uses test.

Even if no typology of gifted students can be established with our data of gifted secondary school students, all in all, the usefulness of a multidimensional conception of giftedness could be demonstrated impressively. The achievement behavior of the intelligent and creative gifted showed the distinctions of both groups, the intelligent showing advantages inside, the creative outside school. With respect to the creative gifted it seems to be of major importance for quidance counseling and curricula as well as for fostering that creativity is a giftedness trait that seems to unfold full power in self-controlled learning and achievement situations, especially in older youth or maybe university students. For education in the schools this means that schools should provide creative youth with (extracurricular) possibilities to work and learn in a more free, self-controlled atmosphere in order to support the development of their creative potential. Otherwise individuals and society losing precious gifted potential.

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