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Myth and Reality: a review of empirical studies on giftedness

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In this review all empirically based articles published in the years 1997 and 1998 in five acclaimed journals in the field of research of high ability and talent will be compared. For this purpose several questions will be taken into consideration, including the problems of the identification procedures used, the predominating research questions and the quality of the methodological standards. The results show that it is difficult to compare the studies due to the various procedures used to identify giftedness. In contrast, regarding the thematic orientation of the research studies themselves, the existence of a virulent problem in gifted research could be confirmed. The methodological standards adhered to in the studies give rise to troubling thoughts, possibly the most worrisome outcome being that the integration of a control group occurred in less than one-quarter of the studies. A definitive result of the study is the confirmation that gifted research is conducted within the framework of a fragmented research community where studies are performed under various methodological viewpoints, which are often unsatisfactory. The appearance of approximately one new publication per day is accompanied by the dangers of a metamorphosis of quality into pure quantity and the loss of any sort of conceptual overview. The aim of this article is, therefore, to determine whether these suspicions can be substantiated specifically regarding theoretical and methodological aspects of empirical studies in giftedness research.

Theoretical Perspectives

Most definitions of a *scientific theory* agree that it pertains to a set of statements or hypotheses which intend to explain a set of data (Stegmüller, 1974, 1985). It is of the utmost importance to realize that the theory defines the data for which this theory could be relevant. Therefore, results obtained under one conception of giftedness cannot be readily compared to results obtained under a different conception of giftedness. A good example of this would be the Three-Ring-Conception of talent developed by Renzulli, which defines giftedness as a combination of high intelligence, task commitment and creativity (Renzulli, 1975, 1986). Here, statements about giftedness are statements about persons who demonstrate above-

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average capacities in all three of these areas. As a consequence, research studies in which giftedness is equated with high performance levels (cf. Howe *et al.*, 1998), and which seek out suitable participants for such an investigation, would not be able to confirm the value of the Three-Ring-Conception.

The operationalization problem depicted here is, of course, a general scientific problem (cf. Bunge, 1998), which appears to be particularly problematic in the area of giftedness research. A passing glance into the relevant journals and handbooks for giftedness research shows that high ability can be counted among the dreaded "toothbrush concepts". It seems that everybody has a toothbrush, but nobody wants to use a toothbrush which belongs to somebody else. How can the data gathered from one study be carried over to another study when differing operationalizations of the object under investigation have been deduced from different theories?

Unusual talents are, by definition, already a rare resource, which in and of itself makes accessibility to this research field difficult. It is also well known that due to pragmatic and economic grounds it is often the case that sub-optimal operationalizations of giftedness must be accepted. This is also a result of the fact that many theories are so complex in nature that they necessitate, and even demand, extremely costly and construed selection processes when seeking talented participants (e.g. Gagné, 1991; Heller & Hany, 1986). Nevertheless, it is a serious problem when theoretical conclusions are taken from studies in which the subjects investigated do not meet the definitions of talent depicted in the theoretical bases of the studies themselves. For example, the participant prerequisite employed in many giftedness studies is simply IQ (e.g. Ziegler *et al.*, 1996) or achievement (e.g. Piirto, 1998). Although this is comfortable, it does not reflect the degree of differentiation inherent in modern theories of giftedness (Heller *et al.*, 1993).

The first aim of this article is to investigate the identification criteria which are used in empirical studies of giftedness.

A second aim would be to determine what the most important research questions currently being pursued in the field of giftedness are concerned with.

Recent decades have been witness to major theoretical developments in giftedness research. For example, it is increasingly accepted that talents are not automatically transformed into high performances, but are dependent on specific environmental factors (cf. Howe *et al.*, 1998). Similarly, high achievements are understood as an interaction between unusual talent and high levels of motivation (Heller *et al.*, 1993). A review of research questions, therefore, may offer insight regarding the degree to which these developments are mirrored in empirical studies.

Methodological Perspectives

Similar to the analysis of the theoretical concerns, the methodological aspects of these empirical research studies were investigated from an exploratory perspective. Of primary interest was the determination of what sort of design the empirical

studies utilize. This is important because different methods lead to unique results, which have unique strengths and weaknesses. For example, longitudinal studies are well suited to the investigation of change, while case studies allow for an in-depth analysis of a person, whereby severe problems regarding the generalization of such results come to light. Cross-sectional analyses, on the other hand, are mainly based on mean value comparisons and have all of the known problems which are inherent in this method. Finally, one-sample studies serve to recount exact investigations of a specific population. Such studies among the highly gifted have clearly limited power due to the lack of control-group comparisons.

It is also of importance to know what sorts of measuring instruments are being employed. For example, although unstructured interviews often permit an in-depth analysis, the objectivity must, for the most part, be sacrificed. In contrast, the objectivity of an observational methodology offers a more *secure venue*, although the unavoidable external perspectives could, under certain conditions, bring up questions concerning the validity of the study.

Further Concerns Regarding High Ability/Giftedness Investigations

Many new insights about the gifted have been gained with subject groups taken from special promotional programs developed for the gifted. One can come up with several reasons why the results of such studies may not be comparable with the results of studies conducted with gifted groups drawn from the general population. For one thing, they often have more money at their disposal and the sample is therefore available to the researcher for a longer period of time, allowing for the development and implementation of more elaborate research designs. On the other hand, it is also often the case that only a limited number of places in such programs can be made available, thereby making study participation dependent on placement variables. Furthermore, it is often difficult to strictly adhere to various methodical standards, such as the recruitment of a control group.

The age variable is another factor, which, in many respects, can exert an influence on the planning of empirical experiments. For example, young children are not capable of performing in the same manner as adults, which leads one to assume that achievement would play a greater role in the identification of gifted populations among older age groups. If age-dependent identification criteria are employed, then one needs to seriously question the generalization of the results from one age group to another. Age variables can influence other aspects of a study. One may assume, for example, that it is predominantly younger children who wind up participating in promotional programs, adults to a much lesser degree. This leads to the conclusion that studies employing participants drawn from pre-existing programs would suffer from an over-representation of information drawn from lower age groups. Out of the several possible influences one more should be mentioned. It is fully possible to imagine that a larger proportion of case studies would be conducted among adults due to the fact that they would be more likely to be identified in investigations for talent.

Review of Empirical Studies

Aims of the Current Research

In this article the focus will be on empirical studies made on talent and giftedness. These studies will be analyzed from several perspectives. From a theoretical perspective it is of interest to know: (1) who is being investigated by giftedness research, or in other words, what criteria are being engaged to define the gifted; (2) which research questions are being most frequently posed and explored by members of the research community. It is also important; (3) to be able to characterize these empirical studies with respect to the methodological techniques employed. Our final question; and (4) addresses the relationship between the variables named above. That is, the relationships between methodological (design, measurement instruments, age, participant recruitment) and theoretical aspects (identification criteria, objectives of the studies).

Method

Sample

Data was collected by analyzing all empirical studies involving gifted subjects reported in five English-language journals published during the calendar years 1997 and 1998. The journals under consideration were *Gifted Child Quarterly*, *Gifted Education International*, *High Ability Studies*, *Journal for the Education of the Gifted*, and *Roeper Review*. Our sample consisted of 90 articles, which published original data. Our data bank was garnered as follows: in the *Gifted Child Quarterly* 22 empirical studies were found among 42 contributions. *Gifted Education International* released 10 empirical studies out of 55 contributions. *High Ability Studies* supplied us with five empirical studies of 31 contributions in all. *Journal for the Education of the Gifted* offered 20 empirical articles from a total of 35 contributions. Finally out of 110 contributions to the *Roeper Review* 33 empirical studies were published.

Most of the remaining articles published during this time period were not empirical studies and therefore not included in our data set. They were literary reviews of works published in other fora, position papers presenting theoretical models and opinions, proposals for possible future empirical research, and biographies or interviews of leaders in the field of giftedness research.

Analysis Categories

Of interest in each article were: the population examined by the researchers with respect to the criteria used to define giftedness; the age span of the subjects involved, sample size, and the recruitment policy followed to establish the gifted population. Also, the following were of interest: the study design employed by the researcher and, in particular, the existence of an ability-related control group; the measurement methods utilized in the study, and the dependent variables under consideration.

The populations considered by the various researchers could be differentiated

Table 1. Method and theoretical aspects of empirical studies published in 1997–98 in *Roeper Review*

Author/s (year)	Criteria	Sample (size)	Dependent variables	Method	Measure design
Gallagher, Harradine & Coleman (1997)	I, A*	X (871)	MO	Q	X
Hébert (1997)	I	G (1)	EV	I	C
Schommer & Dunnell (1997)	I, A *	H (69)	NT	Q	S
Matthews (1997)	I, A, C*	M (348)	AC, EM	Q, R, T	S
Davalos & Haensly (1997)	*	A (90)	EV, MO	Q	S
Ackerman (1997)	C, I, A, N*	H (79)	EM, PL	Q	X
Nail & Evans (1997)	I, A*	H (212)	EM	Q	X
Hall & Hansen (1997)	A	A (312)	PL	Q	X
Alsop (1997)	I	A (42)	PP	Q	S
Shumov (1997)	I	X (3)	EN	I, D, O	C
Orange (1997)	*	H (109)	PL	Q	X
Zorman (1997)	*	M (60)	EV, AC	T	L
Porath (1997b)	I	X (33)	NT	I	X
Ford & Harris (1997)	I, A,	M (152)	SC	Q	X
Ablard (1997)	I	M (174)	EM, SC	C, Q	X
Galloway & Porath (1997)	I	X (23)	NT	Q, R	X
Jackson (1998)	I*	H (—)	EM	I	S
Willings (1998)	A	H (3)	SC	-	C
Farenga & Joyce (1998)	I, A, N*	M (111)	MO	Q	X
Voyer (1998)	A	U (123)	AC	T	X
Burns, Johnson & Gable (1998)	I	M (500)	PL	Q	X
Edmunds (1998)	A*	H (90)	EV	Q	S
Castillo (1998)	*	G (63)	EV, AC	T	X
Piirto (1998)	A	A (80)	CA	Q, D	S
Rogers (1998)	A	A (89)	CA, AC	Q	S
Grantham & Ford (1998)	I, A*	H (1)	EN	O, I, D	C
Dresel, Ziegler, Broome & Heller (1998)	I	M (1188)	AC	T, A	X
Noldon & Sedlacek (1998)	*	U (325)	MO, AC, BE	Q	X
Bizzarri (1998)	A	X (3)	EN	I, O	C
Whatley (1998)	A	A (12)	EN	I, D,	C
Schlosser & Yewchuk (1998)	A	A (197)	EN, EM	I	S
Plata & Masten (1998)	I, C, B	M (119)	BE	Q, R	X
Moulton, Moulton, Housewright, & Bailey (1998)	I*	H (14)	EN	Q	S

A legend for abbreviations used in Tables 1–5 is available in the Appendix.

along three variables: age group, sample size and recruitment policy. To simplify later statistical analyses in the initial review six age categories were formed under the following conditions: pre-school through age 10 (i.e. grade 4), ages 11–14 (i.e. grades 5–8 or middle school), ages 15–18 (i.e. grades 9–12 or high school), university students, adults, and mixed/miscellaneous groups. Initially the mixed groups held several studies in which involved subject groups crossed the boundaries

Table 2. Method and theoretical aspects of empirical studies published in 1997–98 in *Gifted Child Quarterly*

Author/s (year)	Criteria	Sample (size)	Dependent variables	Method	Measure design
Jauovec (1997)	I, A*	U (34)	NP	T	X
Hunsaker, Finley, & Frank (1997)	I, C, A*	X (121)	EV	R	X
Schwanenflugel, Stevens, & Carr (1997)	I*	G (62)	AC	T	X
Sowa & May (1997)	*	X (29)	EM, EN	I, O	S
Lando & Schneider (1997)	I, A*	M (32)	EN, PL, BE	O	X
Tucker & Hafenstein (1997)	N	G (5)	PL, EM	O, I, D	C
Wright & Leroux (1997)	I, A, N*	H (25)	SC	Q, I	S
Filipelli & Walberg (1997)	A	A (21)	EN, PP	D, C	X
Windecker-Nelson, Melson, & Moon (1997)	I*	G (28)	EN	Q, T	S
Robinson, Abbott, Berninger, Busse, & Mukhopadhyay (1997)	I	G (276)	AC, EV	T	X
Ramsay & Richards (1997)	I, A*	M (851)	EV, EN, MO	Q, O	X
Hansen & Hall (1997)	A	A (167)	AC, CA	Q, D	S
Baker, Bridger & Evans (1998)	A, N*	X (56)	EN, MO	R, Q	X
Alexander, Noyes, MacBrayer, Schwanenflugel & Fabricius (1998)	N, A, I*	G (36)	NT	T	X
Parker (1998)	I	M (828)	PL, EN	Q, C	X
Siegle & Reis (1998)	*	H (5385)	NT	Q	X
Diaz (1998)	I, A, B*	H (6)	SC, EN	I, O, D	C
Reis, Westberg, Kulikowich & Purcell (1998)	I*	X (336)	AC, EV	T	X
Robinson, Weinberg, Redden, Ramsey & Ramsey (1998)	I, A	G (154)	EN, EV	Q, I	X
Stumpf (1998)	I, A	M (896)	AC	T, R	X
VanTassel-Baska & Bass, Ries, Poland & Avery (1998)	A, I*	X (1471)	AC, EV	T	X
Hertzog (1998)	I*	G (11)	EV, MO	O	X

of two of the age categories (i.e. ages 8–12). Later analyses, however, were conducted with collapsed versions of these groups, and the primary and middle-school groups were combined, as were the university and high school students. Thereafter, the reduced mixed/miscellaneous group contained studies involving multiple generations of one family, cross-sectional studies involving grades 1–12, and studies where no subject age information was made available.

The sample sizes for the individual studies were recorded and grouped along the following criteria: 1–20; 21–100; 101–400; and more than 400 participants. Sample

Table 3. Method and theoretical aspects of empirical studies published in 1997–98 in *Journal for the Education of the Gifted*

Author/s (year)	Criteria	Sample (size)	Dependent variables	Method	Measure design
Porath (1997a)	A, I	X (217)	AC, EV	T	X
Delcourt, Lyn & Rejskind (1997)	A*	H (195)	SC	Q	X
Johnsen & Ryser (1997)	A, I, C	G (216)	EV, AC	T, R, A	X
McLaughlin & Saccuzzo (1997)	I, A, B*	M (805)	NT, EN	Q, R	X
Metha & McWhirther (1997)	A, I, C, B*	M (72)	EM	Q	X
Kitano (1997)	N	A (15)	EN, CA	I	S
Mason (1997)	I, A, N*	M (120)	AC	T, I	X
Herzog (1997)	I, B*	G (11)	MO, EV	O, R, Q, I	S
Kitano (1998a)	N	A (15)	EN, CA	I	S
Gaultney (1998)	I, A*	X (33)	EV	T	X
Goldberg & Cornell (1998)	N, I, A*	G (949)	MO, SC, AC	Q, T	L
Ablard & Tissot (1998)	I, A	X (150)	AC	T	X
George & Scheft (1998)	A	M (110)	MO, PL	Q	X
Kitano (1998b)	N	A (15)	EN, CA	I	S
Wilcove (1998)	*	H (13)	SC	I	S
Hébert (1998a)	A, I	H (2)	EN, AC, MO	O, I, D	C
Williams (1998)	N, A*	H (103)	SC, AC	Q, T	X
Plucker (1998)	N, A, I*	X (749)	PL	Q	X
Frey (1998)	*	M (18)	SC	O, I	S
Hébert (1998b)	N, I, A*	H (1)	EV, EN	O, D, I	C

spaces of more than 1000 subjects were rare, and one study reporting the results of information gathered from a wide-ranging longitudinal project gathered data from 5385 fourth-grade students.

Particular attention was also paid to the manner in which the researchers recruited their samples. A clear distinction was made between studies which culled their subjects from existing gifted programs and those which used specific criteria to identify gifted individuals in the general population.

The criteria used to select gifted subjects were also considered in the review. Most

Table 4. Method and theoretical aspects of empirical studies published in 1998 in *High Ability Studies*

Author/s (year)	Criteria	Sample (size)	Dependent variables	Method	Measure design
Spiel & von Korff (1998)	A	A (145)	NT	Q	X
Radford (1998)	A	X (267)	EN, PP	D	C
Pufal-Struzik (1998)	C	M (60)	SC, BE	Q, T	X
Lee-Corbin & Denicolo (1998)	I, N	X (34)	PP, EN	I, O, D	X
Robazza & Bortoli (1998)	A	A (8)	PL	I	S

Table 5. Method and theoretical aspects of empirical studies published in 1997–98 in *Gifted Education International*

Author/s (year)	Criteria	Sample (size)	Dependent variables	Method	Measure design
Leroux (1997)	*	X (50)	EN, AC, BE	Q, O	X
Zhiping & Pengzhi (1997)	N*	G (-)	AC, EV	A	S
Shillor (1997)	N, A*	X (14)	AC, EV	A	S
Cho (1997)	A*	A (162)	CA	Q	X
Reuterberg (1998)	I	A (744)	AC, CA, EN, MO	Q	L
Leroux (1998)	A	A (40)	CA, EN	I, Q	X
Vialle & Paterson (1998)	A	A (5)	EV	I	C
Landau & Weissler (1998)	I, B*	X (221)	EM	C, T	X
Sieglen & Trost (1998)	A, I, B*	A (40)	AC, CA	A, Q	X
Plucker & Taylor (1998)	N, I, A*	X (624)	SC	Q, A	X

of the studies had multiple criteria regarding the selection of their study participants. In general, five classes of selection criteria could be isolated:

Intelligence involved the use of various intelligence and aptitude tests such as the Iowa Test of Basic Skills, Test of Cognitive Skills, Stanford-Binet L-M, Cognitive Abilities Test, Scholastic Aptitude Test, Comprehensive Test of Basic Skills, Raven Standard Progressive Matrices, British Picture Vocabulary Scale, Peabody Picture Vocabulary Test and the WISC III.

Achievement comprised scholastic, vocational and athletic awards, honors and recognitions by evaluators and colleagues and high achievement test performance, also included here were samples which were created with the use of reference books such as *The Dictionary of American Poets and Writers* and national versions of *Who's Who*.

Creativity was inferred by studies employing creative abilities tests, group inventories for creative talent, or an assessment of the demonstration of creativity by a teacher or parent along the guidelines of a Renzulli-based program.

Behavior-related criteria were utilized by investigations employing the Scales for Rating Behavioral Characteristics of Superior Students, or the identification of underachievers who exhibit the behavior of gifted pupils through observation or analysis of behavior checklists.

Nominations were made in three forms: by teachers; by parents, often in borderline cases for gifted program nominations; and by peers, most often in studies involving the career achievements of gifted adults. In cases where the subject pool was extracted from an existing gifted program, the criteria to enter this program were recorded for our review. In some cases additional requirements were made on the program participants before they were drawn into the studies; in these rare cases the criteria noted represented a composite of the criteria employed by both the program and study organizers.

The design of the studies in this review were also of interest. Four specific design

types were encountered: case studies, longitudinal studies, one-sample studies, and cross-sectional studies. *Case studies* were considered to be both individual case study descriptions of gifted persons and their experiences, and multiple case studies such as the documentation of the histories and accounts of three generations of gifted females in one family, or the events surrounding a specific number of members of a gifted program or classroom. *Longitudinal studies* were usually short-ranged in that measurements were made within 12 months of each other, often surrounding an intervention, although 5- and 7-year developmental studies were also at hand. *Cross-sectional (comparative) studies* are those studies concerned with the question of inter-group differences. Research questions categorized into this group include gender studies, grade and age differences, parental vs. teacher assessments of social skills, ethnic differences, nomination vs. non-nomination to a gifted program, occupational choice differences, nationality differences, and intervention effects. Of particular interest here was the choice of the researchers as to the inclusion (or non-inclusion) of a control group of non-gifted subjects in the study design. This information was recorded separately. Studies concerned exclusively with results from a homogenous group of subjects were categorized as *one-sample studies*. These studies primarily related the results of an investigation made with gifted subjects in a generalized form, without the benefit of a comparison group.

Distinctions were also made regarding the various, often multiple, measurement techniques utilized by the researchers. *Questionnaires* were considered to be scalar instruments intended to measure some psychological aspect of the subject in a paper and pencil or computer driven format. These instruments were, for the most part, designed by the researchers themselves to investigate areas of interest such as epistemological beliefs, personality aspects, emotional adjustment, and so on, although some previously published scales were also employed. *Testing*, although also done primarily in paper and pencil or computer driven format, was considered to measure a specific skill or ability such as metaphor comprehension, knowledge of physics, and geometric understanding. Included here is also electroencephalographic (EEG) testing of alpha activity during problem solving. Face-to-face *interviews* as well as telephone interviews were conducted with both adult and juvenile subjects. In some cases, the interviewer had previously prepared question lists which were to be strictly adhered to. In others, a free format was encouraged and the subject was to discuss what came to mind. This was often the case in adult interviews attempting to encapsulate career achievement data. *Observations* were often made of children in a specific intervention or gifted program attempting to record behavioral information, or evidence of intervention effectiveness. *Ratings* made by teachers, parents and peers were employed by many researchers. Several studies investigating emotional and social variables such as the effectiveness of a cooperative learning environment or children's social skills relied on peer and teacher ratings of the subjects. One instrument which often surfaced was Renzulli's Scales for Rating Behavior Characteristics of Superior Students. *Document review* was vital for studies involving career achievement profiles as well as profiles of underachieving gifted students and consisted of reviewing scholastic and college records, employment records, résumés, publication lists, private documents and publications made

by the subjects. In some cases document reviews were a condition for selection to a gifted program; here this consisted of accessing teacher grade reports and standardized test scores. *Achievement measurements* were exclusively made in studies reporting the effectiveness of interventions or gifted programs, and in one study where the effect of prior knowledge in physics on scholastic grades was examined. *Check lists* were used to subjectively report personality aspects and self-perceptions.

The dependent variables pursued by the researchers were varied and often relevant to several categories. A differentiation regarding dependent variables was therefore made along the following guidelines: *Achievement* was indicated by studies investigating skills, talents or abilities in some specific cogent form such as the identification of talent in the visual arts and sciences, the development of cognitive skills, metacognitive knowledge, or academic development. *Motivation-based* variables included academic attitudes, scholastic motivation as well as general motivational questions. *Emotion* was inherent in questions addressing topics dealing with emotional aspects of adjustment, sensitivity, intensity, and depression. Variables touching on *naïve theories* included personal comprehensions of intelligence, epistemological beliefs, and implicit theories, perceptions and concepts in the areas of creativity, mental activity and intelligence. *Self-concept* variables related self-perception, self-discovery, identity, academic self-concept and self-acceptance. Studies categorized as *program evaluations* were primarily concerned with relating the resulting data from a specific intervention, assessment instrument, or gifted program. In some cases, the validation of criteria used to accept students into a gifted program, such as teacher nomination or portfolio review, were investigated. *Personality aspects* of participants were often of interest; examples here include perfectionism, learning style, pessimism, coping strategies, and mental preparation strategies. *Career development* aspects embraced such variables as life-span achievement, factors influencing success, and personal career advancement. Variables which considered external influences on the subject were categorized as *environmental* variables and included obstacles and challenges, labeling, feminism, childhood conditions, birth order and other family factors. A study which develops a *personality portfolio* is differentiated from one focusing on a personality factor in that a picture of the subject is developed through the identification of numerous personality traits and these multifaceted composites are compared and contrasted. *Behaviors* considered by the researchers included socio-affective behaviors, behavior control and acceptance. In one study the *neurophysiological* variable of EEG alpha activity was taken as the dependent variable.

All studies were coded by two graduate students in the LMU Department of Educational Psychology. Agreement in all categories was 96% or better, with differences being resolved by a third party.

Statistical Procedures

Statistical analyses were mainly based on the χ^2 -test, and when more than two variables were analyzed, a loglinear analysis was performed. The latter intended to show the relationships held among non-linear or discrete variables, and is particu-

larly useful when more than two variables are to be considered. In effect, this is a procedure that deals with multiple categorical variables simultaneously (Howell, 1997). At its base is the attempt to explain observed cell frequencies, although instead of dealing with these frequencies themselves, the natural logs of the column and row effects are summed in order to model the cell frequencies.

Results

Identification Criteria

A complete overview of the information garnered from the studies reviewed is offered by Tables 1–5 (for coding used see Appendix). For statistical purposes the original identification criteria collected were arranged into four categories. Achievement as well as intelligence were frequent enough to warrant their own categories. Parental, teacher and peer nomination were grouped together under the label nomination; multiple criteria cases were those studies where more than one type of criteria were reported by the researchers. However, studies using more than one type of nomination criteria without the benefit of alternative criteria were grouped into the category nomination. Of the 90 studies reviewed in this article, 80 (88.9%) reported the criteria used in defining their gifted populations. The criteria most often cited, among those studies reporting, were achievement (22.2%) followed by intelligence (18.9%) and nomination (5.6%). Multiple criteria-based studies were by far the most frequent (41.1%) whereby the coupling of achievement with intelligence (either alone or within larger variable constellations) occurred in 38.8% of the studies, which did report the criteria used. Behaviour occurred as part of a variable set in three studies. Of the five studies reporting creativity as a criterion for giftedness only one considered it to be the sole criterion, thereby disallowing categorization of this study into our statistical framework.

Research Questions of the Empirical Studies

As expected, the widest variety among the studies examined was to be found in the research questions under consideration. Once again, to optimize statistical analyses, thematic categorization of the dependent variable types investigated were undertaken. Studies interested in career development and achievement variables were grouped together resulting in the integration of 13 (14.4%) studies which looked exclusively at achievement variables. The second thematic grouping combined those studies interested in motivation, emotion, self-concept, personality as well as personality profiles, and behavior into one group focusing on personality. Here 29 (32.2%) studies could be rated as looking at variables in this family. Studies concerned with naive theories were categorized as dealing with theories concerning either achievement or personality variables and grouped into the corresponding superordinate groups. Program evaluation (5.6%) and environment (6.7%) were left as independent groups. One study (1.1%) measuring neuropsychological aspects could not be incorporated into the described framework above. The remaining 36 (40%) studies

were involved with variables, and could be incorporated into more than one of the above four categories. The most frequent combination was that of personality and environment, which occurred in 14 (15.5%) of the studies, 3 (3.3%) of which also considered an achievement aspect. Achievement and program evaluation were paired in 9 (10%) cases, and the combinations, achievement and personality, as well as achievement and environment were found in 7 (7.8%) studies respectively.

Recruitment Policy

The policy employed by the researchers to assemble their samples was predominated by the preference to recruit study participants from pre-existing programs and classes. Out of the 90 studies considered, 41 (45.5%) recruited subjects from the general population using the above-mentioned selection criteria, while the remaining 49 (54.5%) relied on the selection policies employed by program coordinators.

Age

The studies reported a wide range of age categories for the subjects of their investigations. The original literature review grouped this information along the following lines: categories were pre-school through grade 4, grade 5–8, high school, university, adult, and mixed. The mixed studies examined subjects falling across these categorical boundaries such as grades 6–12. For statistical analyses these categories were further grouped as follow: pre-school through grade 8, high school and university students, adult populations and mixed. Studies examining younger subjects were most frequently observed (52.2%), followed by high school and university students (28.9%), and adults (13.3%). By making these generalizations, the number of studies falling into the mixed category dropped from 19 to 5 or 5.6%.

Sample Size

Four groupings were made under the variable sample size. Studies engaging 20 participants or less represented 23.3% of the sample, and formed a group which was predominantly composed of single and multiple case study investigations. Other studies reported sample sizes in the following ranges: 21–100 subjects were active in 28.9% of the studies; a rate of 28.9% was also found for studies involving 101–400 subjects; and studies of samples spaces greater than 400 accounted for 13.3% of the data base. Surprisingly, 5 (5.6%) studies did not see any reason to report the number of subjects involved in their investigations.

Study Design

Of the various study designs employed, 13.3% were of a case study nature; this includes both individual case studies as well as multiple case study analyses. A longitudinal approach was reported in 3 (3.3%) studies. The most common method employed was a cross-sectional design (58.9%), which encompasses both control-

group studies as well as comparative studies such as gender or age comparisons. A large number of researchers opted for a single sample study (24.4%) in which the results of a single group are reported and generalized. Remarkably, control groups themselves were employed in only 20 (22.2%) of the 90 articles reviewed.

Measuring Instruments

For statistical analyses the measuring instruments employed by the researchers were categorized as follows: in 23 (25.6%) studies questionnaires provided the researchers with all of the information they intended to collect. In 12 (13.3%) studies the construct in question was measured exclusively in a testing format, and 10 (11.1%) were able to acquire all of their data in interviews. Most frequently a multiple measurement approach (41.1%) was used, which incorporated two or more of the above mentioned instruments as well as ratings, document reviews, observations, check lists and achievement measurements. The most common combination was interview and observation measurements which occurred 11 (12.2%) times, of which 7 (7.8%) occurrences also included document review, the pairing questionnaire and testing was observed 5 (5.5%) times, and the pairing questionnaire and rating was observed 6 (6.7%) times, respectively, in the 90 studies under review. One study (1.1%) did not indicate how the dependent variable was measured, and 7 (7.8%) used methods which could not be categorized into the above schema; these included individual applications of achievement measurement, observations, document review and ratings.

Characteristics of Studies Based on Existing Programs

Next, attention will be paid to comparing studies, which cull their participants from existing programs, to those which do not. As expected, their clientele is younger; approximately 85% were recruited from primary, middle and high school, while only 15% of the remaining studies focus on another age group, $\chi^2 (3, N = 87) = 21.59$, $p < 0.001$. The mean size of the samples in studies based on program populations was roughly the same as that for the samples of the other studies, $\chi^2 (3, N = 87) = 3.78$, $p > 0.10$. One should emphasize, however, the fact that a substantial difference regarding policy of recruiting participants for investigations could be proven, (Fisher's Exact Test, $N = 77$, $p < 0.001$). Studies based on programs were less likely to choose their participants based on achievement alone (11.1% vs. 39.0%) and IQ alone (15.4% vs. 26.8%), but rather on the basis of several criteria (69.4% vs. 22.0%). No differences could be isolated with regard to study design application (Fisher's Exact Test, $N = 87$, $p > 0.10$). In particular, the opportunity to conduct a longitudinal study, which should be attractive to program participants due to the availability of their members, was largely ignored (4.3% vs. 2.4%). There was no difference to be seen when a control group was used, $\chi^2 (1, N = 87) = 1.53$, $p > 0.10$; a phenomenon which only seldom occurred in both groups (28.3% vs. 17.1%). There was a significant difference, $\chi^2 (4, N = 86) = 8.41$, $p > 0.10$, with respect to the employment of measuring instruments that could be attributed to the

more frequent use of questionnaires (32.6% vs. 20.2%) in the program-based studies, as well as the less frequent implementation of interviews (4.3% vs. 20.0%). With respect to pursuing investigative questions, no difference whatsoever could be found. Neither achievement nor personality aspects nor environment was investigated more frequently. Only the percentage of program evaluations were marginally more frequent among the program-based studies with 30.4% vs. 14.6%, $\chi^2 (1, N = 67) = 3.01, p < 0.07$.

In conclusion, one can securely say that studies which drew their subjects from existing promotional programs could be characterized as different from the studies that employed more comprehensive selection criteria. Studies building on gifted populations for the purpose of their own studies, for the most part, applied one single criterion such as achievement or IQ. Evidence of differential methodology was found in that the usage of questionnaires (more frequent) and interviews (less frequent). These studies could not be differentiated with respect to the orientation of the research at hand.

Relationships between Age of the Participants and Theoretical and Methodological Aspects

It is plausible to assume that many of the results obtained in giftedness research are only applicable to specific age groups. As a matter of fact, a completely different selection criterion dependent on participant age could be confirmed (Fisher's Exact Test, $N = 67, p < 0.001$). Figure 1 illustrates the tendency to make selections based on achievement with increasing age. On the other hand, at the youngest age levels selection based on intelligence is more common than in the other age groups. One can well assume that this finding reflects a wandering concept of giftedness, namely from an understanding of giftedness as a potential for achievement to the conception of giftedness as performance. In addition, selection based on multiple criteria is sharply lower in the adult age category.

This is also reflected in the analysis of the research objectives, $\chi^2 (3, N = 87) = 7.30, p < 0.05$. Achievement was investigated among primary and middle school students in 43% of the studies; on the other hand, only 19% of high school and university students were investigated, and 50% of adults. This result may reflect the predominant interests in either absolute achievement standards, which can only be demonstrated by adults, or the precocious achievements, predominant among the younger age groups, whereby the term achievement is used in a very broad sense including special skills as well as high IQ.

Questions regarding motivation and personality were extremely important among all age groups, with percentages running at 52.3% (primary and middle school), 71.4% (high school and university) and 44.4% (adults). These differences, however, were not statistically significant, $\chi^2 (3, N = 87) = 3.30, p > 0.10$. No differences could be confirmed with respect to how often the environment was investigated among the participants, $\chi^2 (3, N = 87) = 3.46, p > 0.10$, whereby in 25.0%, 23.8% and 44.4% of the studies with younger, middle age levels and adults, this theme was the central question of the investigations.

To determine the existence of possible relationships between methodical and

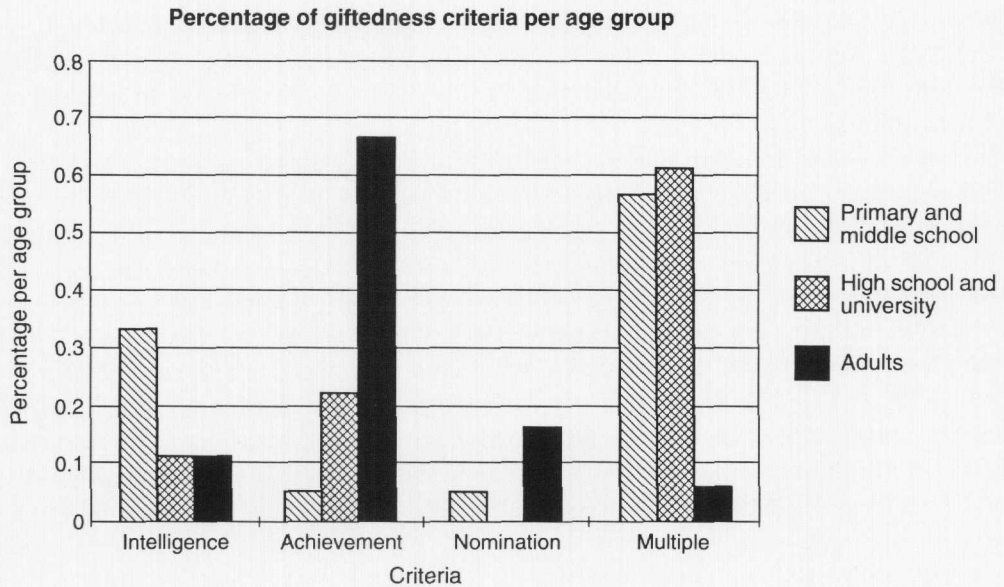


Figure 1. Percentages of giftedness studies involving primary and middle school students, high school and university students, and adults as participants where giftedness was defined by criteria based on intelligence, achievement, nomination or a multiple conception.

theoretical characteristics in the empirical studies a 4 (study design: case study vs. one sample study vs. cross-sectional study vs. longitudinal study) \times 5 (measure: questionnaire vs. interview vs. testing vs. multiple vs. other) \times 5 (identification criteria: achievement vs. intelligence vs. nomination vs. multiple criteria vs. other) \times 6 (study objectives: environment vs. program evaluation vs. personality/motivation vs. achievement/career vs. multiple objectives vs. other) loglinear analysis was conducted. The best fit here demonstrates that in addition to the main effects, four 2-way-interactions are contained within the model. Based on this information a conservative path was chosen, by which an adjusted χ^2 was computed, in that one degree of freedom was subtracted for each cell with an expected value of zero. These adjusted degrees of freedom could cause an underestimation and supply the lower limit for the true degrees of freedom. The reverse model fit is $\chi^2(62) = 87.17$, $p < 0.02$.

The four theoretically interesting 2-way-interactions, which will be analyzed in the following, were significant, each referring to a variable measure as well as the interaction between objective and study design. *Post hoc* comparisons of the observed and expected cell measures in the analysis of the interactions of study design and measurement instruments show that multiple measuring instruments were applied quite often in case studies (8/11, $\chi^2(12) = 28.65$, $p < 0.01$). One sample study, studied interview techniques were frequently used (7/22; expected: 2.5/22) and—contrary to expectations—test measurement less so (0/22; expected: 3/22). Although a cross-sectional study is the study design most engaged (53/79), out of ten studies

in which an interview was conducted, only one was of a cross-sectional design. In contrast, cross-sectional designs proved to be particularly interesting for testing methods in that 11 of 12 studies employing this design used testing as an instrument of measurement.

A significant interaction between identification criteria and measurement instruments further reflects the fact that studies which employ multiple identification criteria also tend to examine the participants chosen for their studies with multiple types of measuring instruments (20/37, $\chi^2(16) = 22.26$, $p < 0.05$). In contrast, studies which chose their participants on only one criterion were relatively less likely to employ multiple measurement instruments (13/41).

A closer inspection of the interaction between study objective and study design, $\chi^2(15) = 33.83$, $p < 0.01$, shows that six studies, in which the environment of the gifted was investigated, was done so as either a case study (4/6) or as a one-sample study (2/6). In examining personality or motivational factors, a cross-sectional study is the preferred design choice (20/29). Cross-sectional studies are also favored in investigations of achievement and career aspects (10/13). In cases where several study objectives were pursued, no aberrations between the observed and expected values of the cells could be found.

Finally, a statistically significant interaction between study objective and measures occurred, $\chi^2(20) = 68.55$, $p < 0.001$. Inspections of the cells show that questionnaires are the primary mode of investigation among questions of personality and motivation (15/23). Testing is usually preferred in questions of achievement and career (4/12) or when multiple objectives (6/12) are being pursued. Aspects of the environment are predominantly examined with multiple measures (5/6).

Discussion

In this work our overriding concern was to take a critical look at current empirical work being done in the field of giftedness and talent. From a theoretical perspective one would want to know what criteria are being used in the selection of talented populations and what research objectives were driving the works reported. In other words, who was investigated and what questions did these investigations aim to answer? From a methodological perspective it is also important to be able to define the types of study designs and measuring instruments employed by the investigators, as well as the age range of their participants. Issues which were pertinent to this review were the method of recruiting study participants as well as the use of control groups. Furthermore, we wished to take a closer look at the relationships between these theoretical and methodological aspects of the reviewed investigations.

The study of 90 empirical studies of giftedness published between 1997 and 1998 in five scholarly journals important to the field provided several important findings. To begin with, a not unexpected, but nevertheless significant, result was that no consistent and uniform criteria for the identification of gifted individuals could be isolated. In most studies only one single criterion was applied. When one considers the fact that criteria such as achievement and intelligence usually demonstrate, at best, slight to moderate levels of correlation (Schneider *et al.*, 1999), it becomes

clear that a generalization across the results of various studies pertaining to giftedness is by no means possible. It may very well be the case that studies in which the gifted are compared to subjects with average talent levels—on the basis of an achievement criterion—are actually identifying a *motivational advantage* in contrast to IQ-based studies. Even when using multiple identification criteria there is no guarantee, assuming that these identification criteria are not identical, that such studies are referring to the same population (Hany, 1993). Interestingly, studies involving younger participants received a great deal of attention in the sample. This is plausible when one reflects on the large proportion of studies which drew their participants from gifted programs that are primarily intended for younger age groups. The diversity of the thematic objectives pursued in the various studies could be collapsed into three thematic categories, namely environment, personality and achievement of the gifted. More than 90% of the studies analyzed research topics in one of these three categories.

More than 50% of the studies draw on a sample with subjects culled from existing programs for gifted students. In comparison to those which recruited their subjects from the general population, they had significantly younger participants. The criteria for selecting subjects were also significantly different in that studies using subjects from existing programs were more likely to have multiple criteria for defining giftedness rather than relying on achievement or intelligence alone. Although this could be traced back to the fact that the programs themselves had set these multiple criteria as requirements for entering the programs, this does have a significant effect on results obtained from such studies. The reason is that the participants here are submitted to more stringent entrance conditions regarding the empirical study itself in comparison to those studies calling for intelligence or achievement-based criteria. This makes comparison of results from one study to the next difficult because those in gifted programs were for the most part younger and thereby developmentally distinct. In addition, they had been selected according to criteria intended for participation in a gifted program, *not* for a specific empirical study. Furthermore, participants coming from gifted programs could already have been aware of their special status in contrast to those drawn from the general public, who were merely informed that they would be participants in an empirical study of some kind (Frey, 1998; Mahoney, 1998). Also important to observe was the choice of measuring instruments used, in that questionnaires were more frequently employed, and interviews less frequently so among the program-based studies. By relying on information gathered through questionnaires the researchers using subjects from gifted programs seem to be focusing on specific information. The questionnaires employed are usually designed by the researchers themselves. In the other studies, where interviews were more frequent, a more direct method of gathering information appears to have been taken, due to the fact that discrepancies or misunderstandings could be more easily cleared up in an interview situation than on a questionnaire. Misunderstanding questionnaires could lead to unintended responses as well as a higher rate of non-answers.

Interesting findings could be isolated regarding age groups. Selection criteria were found to be highly age-dependent; here achievement-based selection to study

participation increased dramatically with age, while selection based on intelligence was predominant among the lowest age levels. It is therefore possible to deduce that giftedness is conceived of populations of differing age ranges and is also investigated differentially. The fact that giftedness is conceptualized in different manners for different investigations renders the relationship between their results difficult at best. To make deductions from these investigations in combination becomes dubious.

It is difficult to defend the opinion that the concept of giftedness needs to be defined along different parameters for subjects in different age groups.

Significant findings regarding method, identification procedure and research orientation need also be discussed. Regarding the significant interaction found between study design and measuring instrument, in which multiple measurements were used in case studies, one may deduce that case studies are subjected to more intense investigation than studies of other design types. Although it is in the nature of a case study to provide a more vivid, enlightening, portrait of an individual, it is difficult to compare information gathered in this manner to information garnered from investigations where only one measurement was made of the participants. Further substantiation of this discrepancy can be found in the significant tendency of studies which utilize multiple identification criteria to also employ multiple types of measurement instruments. Here, again, studies in which an abundance of criteria and measurements are employed are difficult to relate to studies where a single criterion and sparse information sources are used.

Research objectives also afforded significant findings regarding study design as well as measurement procedures. However, these studies are difficult to interpret. In investigations of achievement and career paths, cross-sectional studies were favored over all other research design types. Also, environmental aspects of giftedness are investigated within the framework of either case studies or one-sample studies. Questions regarding personality and motivation are commonly answered through questionnaires, which once again could be traced to the specific design of instruments by researchers in this field.

In considering this body of results four significant points will be adhered to in the following evaluation of the empirical studies in giftedness research.

First, there is a domination of studies with a single identification criterion. Furthermore, the various identification criteria which "plague" this research field make it extremely difficult to relate the results of different studies to one another. There is absolutely no guarantee that these studies deal with the same sub-populations. In addition, there exists a trend whereby identification is subject to a concept of giftedness which is dynamic and age-dependent ranging from a domain-specific identification criterion to specific achievement criteria with increasing age.

Second, three research themes are dominant: achievement, environment and the personality of gifted persons. These research orientations are in accordance with various models of high levels of giftedness (e.g. Gagné, 1991; Heller & Hany, 1986), which allows the possibility of generalizing that the research orientations themselves are *exacting* and theoretically grounded.

Third, from a methodological vantage point, the picture is somewhat unclear. For example, there is a series of studies that investigate large samples of highly gifted

individuals. However, these are in no way to be taken for granted due to the low level of availability of such exceptional individuals in the general population. On the other hand, one finds empirical studies published in renowned scientific journals which neglect to report number of subjects involved in their investigations! Likewise, in contrast to the abundance of measurement instruments applied, the level of diversity regarding research design is rather low. Only 3 (3.3%) of the studies are long-range studies, leaving the research field with a void of studies regarding intra-individual change. Even more unsettling is the fact that a control group of non-gifted individuals was included in only 20 (22.2%) of the articles studied. It is a disturbing observation that for the majority of the results of the empirical studies in giftedness research, it is not known whether these results are typical for the highly gifted or not!

Fourth, studies which draw participants from existing promotional programs do come up with a solid sample. These studies, however, are innately confronted with the problem that participation in a program exercises an influence on the gifted participants, whereby the results cannot automatically be transferred to those gifted individuals who were not promoted.

In summary, the results of this review build the image of a research field, which is more or less fragmented and whose results cannot easily be compared to one another.

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Appendix I

Legend for coding of all the following tables containing an overview of all aspects of empirical articles studied:

Criteria variable coding:	A	Achievement
	B	Behavior
	C	Creativity
	I	Intelligence
	N	Nomination (parental, teacher, self or peer)

(*Note.* * indicates sample was drawn from an existing promotional program)

Sample coding:	G	Grade school, through age 9
	M	Middle school, through age 13
	H	High School, through age 18
	U	University students
	A	Adults
X	Miscellaneous	

Dependent variable coding:	AC	Achievement
	BE	Behavioral
	CA	Career
	EM	Emotion
	EN	Environment
	EV	Program evaluation
	MO	Motivation towards school, academic attitudes
	NP	Neuropsychological
	NT	Naive theories
	PL	Personality
	PP	Development of personality portfolio
	SC	Self-concept, self-perceptions

Measurement coding:	A	Achievement
	C	Checklist
	D	Document review
	I	Interview
	O	Observation
	Q	Questionnaire
	R	Ratings
	T	Testing

Study design coding:	C	Case study
	L	Longitudinal study
	S	One-sample study
	X	Cross-sectional study

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