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Developing Academic Talent: The Roles of Experience, Mentoring, Motivation, and Volition

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Introduction

Those who concern themselves with the nature and development of human abilities have dualist, even schizophrenic beliefs about abilities. On the one hand; we know that abilities are education's most important raw material. Recognizing this fact, psychologists and educators from Binet to the present have searched for better ways to identify those individuals most likely to profit from instruction. The emphasis in this approach is on prediction, the methods are correlational, and the theory is at best one of traits, traits that have the same names at different points in time even though we recognize that substantively they might be quite different things early than late in development. On the other hand, we know that abilities are the most important products of formal and informal schooling. Schooling children helps develop new abilities such as reading and mathematical and helps them sharpen old abilities such as memory span. Thus, the core assumption here is that abilities change over time, and that change is at least stimulated by -- if not a direct reflection of -- training and experience.

Like a reversible figure, we see either the ballisters or the ballerinas. We look at the stability of individual differences, or we look at the immediate and cumulative effects of education and experience. And we error by focusing too much on either one: Those who focus too much on experience and training sometimes talk as if anything were possible for anyone; those who focus too much on aptitude ignore the crucial role that experience plays in developing talent. I believe it helps to be mindful of our own limitations as knowers, to be mindful that we cannot see both ballisters and ballerinas -- that is, constancy and change -- at the same time. In this paper, I briefly summarize four of the major sources of change (or development) in abilities: experience, mentoring, motivation, and volition. Throughout, it is helpful to remember that this is only one side of the picture, albeit the side least emphasized by most.

The role of experience in ability development

Experience is the most well-documented of these four factors. However, it is difficult to appreciate the impact of experience on the development of abilities if one measures abilities using scores and methodologies that mask growth or if one studies only a restricted range of

environments. Scores that mask growth are those that covary age out of the picture. Here is an example. Suppose a child is administered an IQ test every year for four years. The first test is administered when the child is six and the last test when she is nine. We observe IQ scores of 150, 143, 137, and 133. Would we say her ability is increasing or decreasing? Clearly it seems to be decreasing.

Suppose, however, that we look at the mental age scores that correspond to these IQ scores. Note that MA scores are much like a total number correct on a test, or grade-equivalent scores on an achievement test. What we then see are MA scores of approximately 9, 10, 11, and 12. Is ability increasing or decreasing? Clearly, the child is getting better scores on the test each year. Indeed, even her rate of development is average: each year she gains exactly one year on the MA scale. The declining IQ score tells us only that the rate of growth lags behind others of the same rank within the group.

Figure 1a shows another way to see this. I have here plotted the expected relationship between age and intelligence when age-normed scores such as IQ's are used. Intelligence remains constant across age because we have defined it that way. The mean is 100 only because we have decided to fix it at 100. Similarly, the variability in intelligence remains the same across ages because we have fixed it as well. Growth or decline then is then restricted to falling behind or surging ahead of one's age mates. This does not necessarily imply any real increase or decrease in intelligence, only in one's relative position within the group.

Insert Figures 1a and 1B here

Figure 1b shows what happens when we are able to use something like total correct. Ability then grows exponentially with age (or, better, experience) and, for complex skills, the variability increases as well. Figures 1a and 1b tell different tales to those who can read them. Thus, the score scale used to represent ability is one problem.

Another problem is the range of environments studied. Investigators have often found negative correlations between age and IQ for children who live in areas where schooling is inadequate or nonexistent. For example, shortly after intelligence tests were first introduced, Gordon (reported in Freeman, 1934) studied children of gypsies and boat canal pilots in London. At six years old, these children showed MA scores only slightly below that of the average London child. By 16 years of age, however, the average mental age of the group had increased to 9.6. This meant that IQ or rank within group had plummeted to 60.

The point is not merely that some environments are better than others; rather the point is that abilities do not mature of their own accord. Both the type and amount of schooling are predictors of gains or losses in IQ scores (see Hunt, 1961; Snow, 1982 for reviews). Thus, as Snow (1982) puts it: "Educational psychology now recognizes intelligence as education's most important product, as well as its most important raw material" (p. 496).

But probably the single greatest confusion for those who would attempt to understand how improvable human intelligence might be hides quietly in the mundane distinction between means and correlations. Hilgard (1989) claims that one can summarize the long and sordid nature-nurture debate by examining whether the author focused on individual differences (in which case genetic influences were emphasized) or on group means (in which case environmental differences were emphasized). For example, in the Iowa-Stanford debates of the 1930's, Stoddard (of Iowa) found that children of low IQ mothers adopted by parents with average to above average IQs showed large gains in IQ. Terman (of Stanford) focused on correlations between child IQ and IQ's of adoptive and biological parents. The correlations, as well all know, favored a genetic interpretation, whereas the means implicated the environment.

Implications

This view of abilities has a number of implications for educators. I note four.

1. There is a common misperception that low ability children learn because of their teachers, whereas high ability children learn, in spite of their teachers. However, year to year

gains for highs are often twice as large as gains for lows. Therefore, the effects of impoverished or inadequate instruction are actually greatest for highs.

2. The single most important factor in the development of what we call intelligence is formal schooling. The more schooling, the greater the gains in intelligence. Correspondingly, the single most important factor in predicting absolute gains in narrower ability and skill constructs is the amount of focused practice. In a recent review of expert performance, Ericsson and Charness (1994) concluded: Expert performance is predominantly mediated by acquired complex skills and physiological adaptations. For elite performers, supervised practice starts at very young ages and is maintained at a high level for more than a decade. The effects of extended, deliberate practice are more far-reaching than commonly believed. (p. 725) Although Ericsson and Charness can rightly be accused of understating the influence of genetic factors, it is fair to say that most ability theorists even more dramatically underestimate the cumulative effects of five, ten or even twenty years of guided practice.

3. Type of schooling matters, especially for the development of transferable competencies. Rigid systems that emphasize memorization produce different students than educational systems that actively encourages students to stretch old knowledge and concepts in new ways. This is shown in Figure 2. The horizontal line here represents the amount of transfer

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Insert Figure 2 here

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required by problems or their novelty to the test taker. Tests at the far left consist of problems that are duplicates of those taught. As one moves to the right on this scale, problems become increasingly novel and thus require more transfer. Putting "intelligence" or fluid abilities and achievements or "crystallized abilities" on the same line implies that these are best seen as two aspects of the same thing rather than as qualitatively different things (Snow, 1980). In fact, Snow (1980) speaks of fluidization and crystallization processes to describe these different aspects of ability development. He summarizes:

> [Crystallized ability] may represent prior assemblies of performance processes retrieved as a system and applied anew in instructional or other . . . situations not unlike those experienced in the past, while [fluid ability] may represent new assemblies of performance processes needed for more extreme adaptations to novel situations. The distinction [then] is between long term assembly for transfer to familiar new situations vs. short term assembly for transfer to unfamiliar situations. Both functions develop through exercise. (p. 360).

This continuum is probably best understood by considering more specific abilities. One can teach students to play a musical instrument in a highly structured way; such students often show little ability to be innovative or to compose new pieces themselves. We often see the opposite emphasis in art, where students are given paints and told to be creative, but given little structure or direction. Several theorists have defined intelligence or scholastic aptitude as the ability to profit from incomplete instruction -- i.e., the ability to transfer old learning to new situations. Older and more able students are more likely to show transfer than are younger and less able students (see, e.g., Campione, Brown, & Ferrara, 1982). Thus both "intelligence" and "transfer" are descriptors of the same phenomenon. Unless we view abilities as fixed or transfer as unattainable, then the road to achieving transfer is also the road to developing broadly useful abilities.

4. Different aspects of performance are most responsible for individual differences at different points in the development of an ability.

This is easiest to see for well-defined abilities. Gardner (1983) gives a nice example of this in the development of musical competence. As the child progresses, the symbol system changes. Children who excel in remembering and reproducing sounds may stumble when notereading is introduced and those who surmount this hurdle may falter at composition.

Reading and math show similar discontinuities. Even more global thinking abilities show qualitative changes, as Piaget and life-span developmentalists have claimed. This means that many judged "gifted" at one point in time may not be so labeled at a later point in time. This

does not mean that the initial label was wrong; it may simply mean that our theory of ability is undercomplicated. Also implies that there must be a match between the inner environment of the individual and the outer environment, and that the "best" outer environment at one point will not be best at another point in time.

But this brings in the three other factors: mentor (coach), temperament - especially motivational factors and the need to cope with the negative affect and goal disruption that necessarily attend sustained practice.

The role of mentors in ability development

Anecdotal evidence. Lives of eminent scholars, musicians, and athletes provide many examples of the important role mentors play in the development of high levels of ability. Indeed, many parents seek out the best coaches for their children, often sacrificing their lives for the child. Occasionally, the parent will double as mentor, as in the case of John Stuart Mill (see Fancher, 1985). As a preschooler, young John worked at the same table with his father, James. He began Greek at age three by memorizing English definitions of words written on cards. At eight he started Latin, and in turn tutored his younger sister. By 12 he had read and taught the major Latin classics, and in after dinner lessons, learned math through the differential calculus. The elder James Mill was an exacting task master. Each day on a walk, James would lecture on some aspect of Ricardo's writings on economics. The next day, John had to produce a written account of the lecture which "my father made me rewrite over and over again until it was clear, precise, and tolerably complete" (Mill in Fancher, 1985, p. 7). James later used these summaries as the basis for a popular book on economics.

They followed the same procedure for the study of logic. Clearly, this was someone who was mentored. And that was exactly how Mill himself perceived it. In one of the more noteworthy passages in his autobiography, he later wrote:

> I remember the very place in Hyde Park where, in my fourteenth year, on the eve of leaving my father's house for a long absence, he told me that I should find, as I got acquainted with new people, that I had been taught things which youths of my age did not

> commonly know; and that many persons would be disposed to talk to me of this, and to compliment me upon it. What other things he said on this topic I remember very imperfectly; but he wound up by saying, that whatever I knew more than others, could not be ascribed to any merit in me, but to the very unusual advantage which had fallen to my lot, of having a father who was able to teach me, and willing to give the necessary trouble and time; that it was no matter of praise to me, if I knew more than those who had not had a similar advantage . . . I felt that what my father had said respecting my peculiar advantages was exactly the truth and common sense of the matter, and it fixed my opinion and feeling from that time forward. (Mill in Fancher, 1985, p. 9)

An account such as this fits well with apprenticeship models of ability development. As Kessen (1983) put it: "The place of social partners in cognitive development is richly complicated and woefully understood." (p. ___)

Basic psychological evidence. Recent studies of skill acquisition offer support for the claim that mentors are important. For example, Kanfer and Ackerman (1989) has shown that learners who attempt to monitor their own performance while learning a new skill perform less well than learners not so burdened with self-monitoring. Perhaps this is easily explained by the working memory limitations that plague all human learners, and which are especially evident when one is a comparative novice. (Those who continually advance the frontiers of their own knowledge and skill are thus perpetual novices.) Support for mentoring also comes from research on the social foundations of thought and action, especially learning through modeling (Bandura, 1986). Finally, there are scattered studies that touch on the affective bond between student and teacher. Augustine remarks somewhere that the most important thing a teacher brings to students is the example of his character. In other words, the mentoring process is greatly facilitated if the student cares for and identifies with the teacher.

In all of these areas, though, one cannot merely provide the external support and expect that it will work. There must be a match between the internal environment of the learner -- that is, of the learners abilities, needs, wishes, wants, and temperament -- and the external

environment -- that is of the mentoring provided. One way to think of it is that the outer environment offers various affordances for action that must mesh with the inner environment of the learner. And the nature of this coupling, this dance, changes over time. What works for one will not necessarily work for another. What works well at one time may be quite inappropriate later. What works over the short haul may not be best over the long run.

The role of motivation in ability development.

Cognitively-oriented theorists have transformed the study of individual differences in motivation from the study of traits to the study of interpretive processes, attributions, expectancies, and goals. Along the way, however, the construct has been mechanized. Where, for example, is the feeling of being moved by music or the emotion of fear?

Damasio (1994) suggests one place we might look. He describes how, like most neurologists, he envisioned separate neural systems for reason and emotion, until he met a patient he calls Elliott.

> I now had before my eyes the coolest, least emotional . . . human being one might imagine. (In spite of his obvious intelligence) . . . his practical reasoning was so impaired that it produced, in the wanderings of daily life, a succession of mistakes, a perpetual violation of what would be considered appropriate and personally advantageous. He had had an entirely healthy mind until a neurological disease ravaged a specific sector of his brain and caused this profound defect in decision making. The instruments usually considered necessary and sufficient for rational behavior were intact in him. He had the requisite knowledge, attention, and memory; his language was flawless; he could perform calculations; he could tackle the logic of an abstract problem. There was only one significant accompaniment to his decision-making failure: a marked alteration of the ability to experience feelings. (p. xi-xii)

The upshot of Damasio's argument is that "reason may not be as pure as most of us think it is or wish it were: . . . More directly, emotions and feelings may not be intruders in the bastion of reason at all; they may be enmeshed in its networks, for worse and for better." (p. ii). We

have long known that emotion and feeling can disrupt reasoning. For example, Messick (1987) claims that one of the major ways in which personality impacts cognition is through the influence of affect.

> One of the prime sources of personality influence on cognition is the pervasive impact of positive and negative affect. The positive affects of interest and surprise, along with . . . intrinsic motivation and curiosity, are critical in the initiation and maintenance of cognitive functioning, in the selectivity and duration of attention, and in the differentiation and integration of cognitive structure. In contrast, negative affects such as fear and anxiety lead to interference and disorganization of function, to disruption and pre-emption of attention, and to dedifferentiation and primitivization of structure. Furthermore, mechanisms of defense against anxiety and negative affects, being not only self protective but often self-deceptive, introduce distortions of their own into cognitive processing. (p. 36-37)

Messick views defensive styles as consistent ways of organizing and channeling affect in cognition. As such, they are primarily ego-protective, but also serve the important adaptive function of maintaining cognition, in the face of intense affects. I discuss this business of controlling negative affect under the rubric of volition (see below). In any event, it is clear that emotions can wreck havoc. But can they also contribute to thought? Damasio believes they can:

> It is thus even more surprising and novel that the absence of emotion and feeling is no less damaging, no less capable of compromising the rationality that makes us distinctively human and allows us to decide in consonance with a sense of personal future, social convention and moral principle. (p. xii)

This is not a claim that rational processes are not important.

> At their best, feelings point us in the proper direction, take us to the appropriate place in a decision-making space, where we may put the instruments of logic to good use. We are faced by uncertainty when we have to make a moral judgment, decide on the course of a

> personal relationship, choose some means to prevent our being penniless in old age, or plan for the life that lies ahead. (p. xiii)

Passion may be at the fire at the heart of soul compassion the highest human virtue.

The role of volition in ability development

"Volition" is an old term new lease on life. To do something of one's own volition means to do it "by one's own resources and sustained efforts, independent of external source or pressure" (Corno, 1993, p. 14). But early in this century, those who studied motivation claimed this was the proper purview of motivation. Also associations of volition with free will and other "prescientific" concepts from an earlier psychology lead to the abandonment of this construct, at least by most U.S. psychologists.

The German psychologists Kuhl and Beckmann (1985) revived U.S. interest in volition with their theory of action control. Corno and Kanfer (1993) elaborate an educational view of this work. The basic idea is straightforward: motivation concerns those affects and processes that initiate behavior, that move us from wishes to wants to actions. From purely cognitive perspective, it is goal setting. In Kuhl's view, it concerns the "predecisional" phase of action.

Volition, on the other hand, concerns those processes whereby one actively maintains an action, often in the face of competency action tendencies and negative affect. It is post-decisional. Kuhl describes several aspects of volition. Two of the most important are: 1) strategies for the protection of goals against competing goal tendencies, and 2) strategies for the management of affect, especially negative affect. For example, you have decided to perform a task and have even begun to do so when along comes the idea to do something else instead. Do you abandon the first task and take up the second? Here, volitional control concerns how you manage this conflict. Another example: you have decided to go out for the cross country team. It requires that you run several miles each afternoon. Your body objects. Will you listen to your aching muscles? Here, volitional control concerns how you manage the intrusive effects of negative affect.

Recall that the development of high levels of competence requires extended, guided practice over many years. Thus, in my view, understanding how some are able to protect their goals and maintain their efforts to achieve these goals is a crucial topic for the field of gifted education. Many start the journey, but few finish it. Corno and Kanfer (1993) list a variety of volitional control strategies, many of which are designed to regenerate positive affect or to control negative affect.

It is interesting that attempts to integrate modern work on volition into older stylistic or trait view of human performance use words like "responsibility," "dependability," and "conscientiousness" to describe individuals who exhibit these characteristics in many situations. But in order to learn how to persist, one must be challenged. Ultimately, then, we are talking about character building.

Do volitional skills learned in one context transfer to other contexts? Certainly the better than average performance of endurance athletes in college suggests that this might be the case. But such correlational evidence is open to multiple interpretations. Indeed, most modern students of transfer would agree with Thorndike and Woodworth (1901) that transfer is generally quite limited. However, in his 1913 text Thorndike cautioned differently: "Some careless thinkers have rushed from the belief in totally general training to a belief that training is totally specialized." (p. 365) He then gave examples of "general" S-R bonds:

> Of special importance are the connections of neglect. Such bonds as 'Stimuli to hunger save at meal times - neglect them'; 'Sounds of boys at play save at playtime - neglect them'; 'Ideas of lying down and closing one's eyes save at bed time - neglect them,' and the like are the main elements of real fact meant by 'power of attention,' or 'concentration' or 'strength of will.' In so far as a certain situation is bound to the response of neglect it is prevented from distracting one in general. (p. 419)

In modern jargon, Thorndike (1913) would agree with Kuhl that volitional control strategies are among the most transferable of all competencies. Finally, one more quote from the past, this time from Dewey (1938):

> Perhaps the greatest of all pedagogical fallacies is the notion that a person learns only what he is studying at the time. Collateral learning in the way of formation of enduring attitudes, of likes and dislikes, may be and often is much more important than the spelling lesson or lesson in geography or history that is learned. (p.)

I would add "persistence in the face of difficulty" to this list. Perhaps the real crime of our educational system is not that it bores bright children, but that it does not teach them to cope with challenge.

The upside of volition is that it helps an individual maintain focus; but the downside is that it may be hard to disengage these processes once they are firmly entrenched. There is a thin line between persistence and rigidity. Athletes ignore pain at their peril; the body can and does break down. Workers can persist at their tasks until work is all they have, or they have burned out. My experience with one of the individuals Dr. Csikszentmihalyi interviewed would tell a less glowing tale about the possibility of having both an all-encompassing career and a family. Yet some do learn to manage the tradeoff. Good athletes do learn to listen carefully to some pains while disregarding others. This higher level of adaptation is well captured in Sternberg's (1985) concept of "mental self government."

Summary

The potential for great accomplishment may indeed be in significant measure a gift from one's ancestors. However, the attainment of domain expertise comes only after much learning and practice. I would therefore encourage educators to think of ability not merely in terms of current rank within group but also as position on an open-ended developmental scale. What do students know and what can they do? Such scales encourage students, teachers, and parents to focus on what can be learned next. They might also help us understand that ability can be different things at different points in development.

Such scales also encourage us to take a long view, to set our sights on the exploration of domains of knowledge and not simply the preservation of rank within group. But, as Csikszentmihalyi noted, this is not a private affair. Mentors who can support, encourage, and

challenge are crucial. I suspect that the student must perceive in the character of the mentor something that he or she values greatly. Good teachers are not just good technicians. Which then brings in motivation, both in its cognitivist sense as goal setting and the initiation of action, as well as the affective sense of feeling enthused and excited, fostering and maintaining that childlike interest in the world. Strategies to develop and maintain such attitudes can be learned.

Which brings us to volition. If I had one message it would be this: Look into this literature if you can. There is much here for both those who worry about what abilities might be and those who daily concern themselves with their development. Those who would aspire to attaining expertise in one or several domains must develop strategies to maintain focus on their goals, strategies to generate positive affect and enthusiasm, and strategies to ignore or minimize or at least reduce the disruptive effects of negative affect.

Snow (1994) tells us that "abilities are affordances -- properties of the union of person and environment that exhibit the opportunity structure of a situation and the effectivity structure of the person in taking advantage of the opportunities afforded for learning." (p.) Abilities are thus situated. Some persons succeed in learning in a given situation; they are in harmony with it. Others do not, because they are not tuned to the opportunities the situation provides or to produce what it demands. Over the long haul, affect and volition are probably as important in the development of talent as are entry level of ability and opportunities provided.

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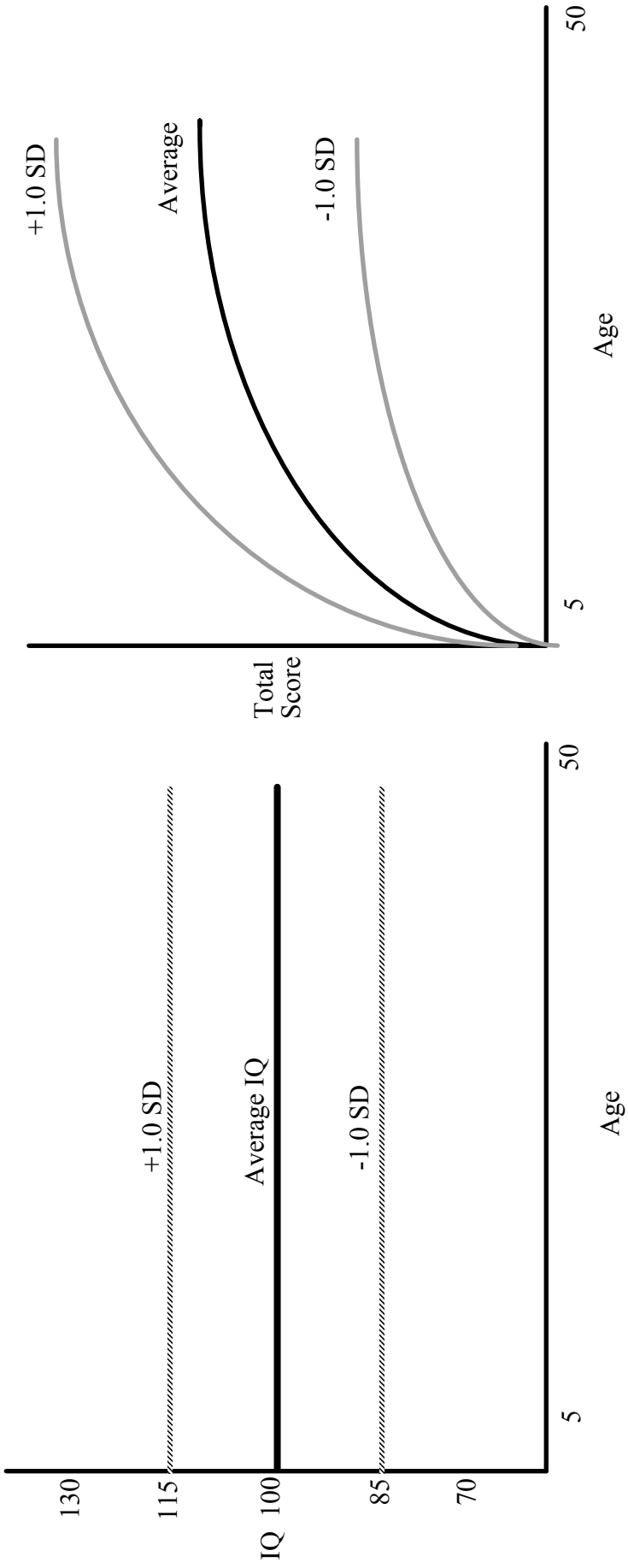
Figure Captions

Figure 1. Relationships between mental competence and age when competence is measured by (a) an age-normed score, such as IQ and (b) a continuous score, total correct.

Figure 2. A continuum of transfer. Tasks at the left require application of knowledge and skills in very familiar contexts; tasks at the right require applications in very novel contexts.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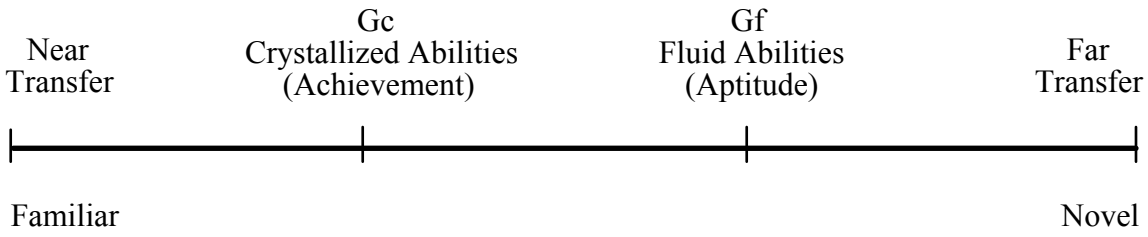
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Transfer
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