Research Article

The theoretical roots of gifted and talented youth education programs: The CTY case example

Justin Petkus[1]

Department of Behavioral and Cognitive Sciences, University of Luxembourg, Grand Duchy of Luxembourg

Article Info	Abstract
	The aim of this study is to examine past literature from a reductionist approach of findings derived from academically gifted and talented youth research, and to examine the factors explaining the roots of such abilities. Also explored are common human development theories of social information processing perspective, social cognitive, attachment and behavioral genetics. This analysis explores these theories and how they can be combined to allow for the best understanding of gifted ability. Detailed here is also the Johns Hopkins University Center for Talented Youth program as a model to show a current example of how theory is being applied to practice in a gifted youth setting. The writing concludes by discussing how research of combined theories on gifted abilities can further inform practice and understanding of gifted children's abilities. Further, research suggestions are provided for meeting the gaps in literature on the roots of gifted youth abilities.

To cite this article:

Petkus, J.M. (2022). The theoretical roots of gifted and talented youth education programs: the CTY case example. *Journal of Gifted Education and Creativity, 9*(3), 299-310.

Introduction

Since 1972 The Johns Hopkins University has been conducting a talent search to identify, challenge and reward academically precocious youth. This emergence led to the formation of the *Center for Talented Youth* (CTY) in 1979, which globally seeks out students of the highest academic ability in order to offer them rigorous educational opportunities. Consistent with the proliferation of literature supporting ability grouping (i.e., Durden, & Mills, 1993; Mills & Durden, 1992; Mills & Tangherlini, 1991; Ireson, & Hallam, 2009; Robinson, 2008; Preckel, Gotz, & Freznel, 2010), CTY unites academically talented children in its three week summer programs where they engage in challenging coursework for six hours a day. In 2009 there were a total of 30 CTY locations in the United States and internationally and the program had served students from every US state and 118 other countries (Ybarra, 2009), making it one of the most well known and respected gifted youth programs worldwide. A Google search inquiry of "Gifted and Talented

[1] Doctoral candidate, Department of Behavioral and Cognitive Sciences, University of Luxembourg, Esch-sur-Alzette L-4365, Grand Duchy of Luxembourg Email: justin.petkus@uni.lu ORCID: 0000-0002-3179-1904

Youth Summer Programs" reveals results from various organizations across the world, typically with university affiliations, thus exhibiting at the very least that such programs are widely marketed and available.

While it is evident that ability grouping of gifted youth has become common in the United States, it remains less clear what the causation of academic giftedness in children is. By contrast, previous research has provided some useful findings in which the results may provide some answers to the addressed dilemma. For example, much literature is provided on sex differences in gifted youth (i.e., Brody, Barnett, & Mills, 1994; Durden, Mills, & Barnett, 1990; Stumpf, 1995; Brody, Fox, & Tobin, 1980). Research on the parents of the gifted youth has also been explored, (i.e. Ablard, & Parker, 1997; & Blackburn, & Brody, 1994. Other factors yet include self-perception (i.e., Ablard, 1997; Ablard, 2002; Ablard, & Mills, 1996), perfectionism (i.e., Ablard & Parker, 1997; Parker, & Adkins, 1995; Tsui, & Mazzocco, 2007), and personality and learning styles (i.e., Mills, & Bohannon, 1980; Mills, 1981; Mills, 1983; Mills, 1993; Mills, & Parker, 1998; Mills, Moore, & Parker, 1996; McCrae, et. al 2002; Parker, & Stumpf, 1998; Runco, & Okuda, 1993). Still, fewer studies address factors such as birth order (i.e., Parker, 1998), and parenting style influence (i.e., Steinberg, Darling, & Fletcher, 1995).

Importance and Aim

Quality gifted youth educational programs are informed by theory to develop their approaches towards meeting both the educational and social needs of their participants. In models where this is not the case, the capacity for these programs to nurture giftedness to its fullest extent becomes limited, and possibly weakens the youth's ability to reach their full potential. In this study, first of all, the theoretical foundations and roots for raising gifted youth will be examined. In addition, the reflection of these theoretical roots in practice will be analyzed through the example of CTY. The questions guiding this study are:

- ➢ What theoretical roots can help underpin and guide gifted educational program approaches towards meeting the optimal training needs required for responding to and elevating these youth's unique abilities?
- ➢ How does the CTY gifted education program implement theory to guide its practice in the nurturing of gifted youth's unique abilities?

Method

The relevant literature has been analyzed in determining the foundations of academically gifted youth. A search of the literature included keywords such as gifted youth, gifted and talented youth summer programs, and precocious youth. The search yielded previous research related to the influences of sex, parenting styles, and personality and learning styles. After identifying and framing the theoretical roots for raising gifted youth, CTY was chosen as an example demonstrating the harmony and consistency of applying theoretical foundations of gifted youth to practice. The purpose of determining CTY as a model case example for review is due to its reputation of being one of the most revered and largest gifted education programs in the world. Various resources on the CTY program were evaluated, including websites, podcasts. The authors own experience as a former CTY staff member informed the understanding of the program and interest in the topic. In line with the purpose of the research, common human development theories of social information processing perspective, social cognitive, attachment and behavioral genetics were evaluated within the context of giftedness.

Results

Influences

Sex Differences in Gifted Youth

Female and male differences in gifted youth have been well documented. In one study, researchers David Lubinski and Camilla Benbow conducted a longitudinal analysis using data collected over a 20-year period from 1972 through 1991 on over 1 million seventh and eighth graders tested on the SAT- Mathematics section. Talent searches were conducted at various gifted youth programs across the country (e.g., Duke, Iowa State, Johns Hopkins, Northwestern, and

University of Denver). The findings of the study show that a greater number of males than females will qualify for advanced training in disciplines in which mathematical reasoning is of significance (Lubinski, & Benbow, 1992). Similar results were found in another study in which academically talented students in grades 2-6 were given a test of mathematical ability. In this study, boys outperformed girls on algebraic rules and algorithm tasks, and those in which mathematical concepts and number relationships was necessary (Mills, Ablard, & Stumpf, 1993). Despite these findings, it is still difficult to determine what accounts for such differences between males and females. Further research is needed to explore reasons for differences found in sex specific gifted abilities.

Parenting Style Influences

CTY documents that its summer programs have served students from over 118 countries. Is it possible that the parenting styles of gifted youth are different than their non-gifted peers? In a 2004 study, Dwairy found that authoritative parenting style positively relates to the mental health of gifted and non-gifted adolescent Arabs, whereas authoritarian parenting style may negatively influence psychological adjustment (Dwairy, 2004). Despite the negative connotation of the authoritarian style, it has been found to be the primary form of parenting among cultures whose children are quite intelligent. Chao for example, explains that the parenting style of Asians has typically been seen as "controlling" or "authoritarian." This parenting style has been found to be a predictor of poor school performance in Americans and Europeans. Results of the study showed that authoritative and authoritarian parenting styles are ethnocentric and don't illustrate the importance of Chinese child rearing. Thus other factors such as the "training" of the importance of education may be of more influence than parenting style (Chao, 1994). The results of this research show that parenting style in a culture may not be a moderator in academic achievement, but rather is a result of the cultures milieu and serve as a mediator. That is, parenting style is not the sole factor contributing to gifted abilities, yet it does impact children's value and attainment of education. Therefore, forecasting of gifted ability based upon parenting style alone is inconclusive.

Personality and Learning Styles

Studies have shown personality and learning differences in gifted students compared to their general population peers. In a 1993 study from Mills, academically talented students expressed greater introversion, intuition and thinking, higher achievement motivation, and lower on interpersonal and social concerns (Mills, 1993). A later study showed that gifted males were more likely extraverted and by contrast, females were introverted. Younger students in general also showed greater extraversion, sensing, feeling and perceiving (Mills, Moore, & Parker, 1996). A 2000 study rendered similar findings suggesting that gifted student's preference imaginative thinking styles, whereas non-gifted students prefer a more practical style. Paradoxically to previous research, gifted and non-gifted students did not show a significant difference in extroversion and introversion, organized-flexible, and thinking-feeling styles. Sex differences were still however present as boys displayed stronger preferences for flexible thinking styles while girls preferred organized and feeling styles. Girls also frequently preferred imaginative thinking styles over boys. In addition, while boys typically preferred thinking over feeling, non-gifted boys showed a stronger preference for thinking that gifted boys (Oakland, Joyce, Horton, Glutting, 2000). The study is misleading by what "stronger preference for thinking" means. That is, it is unclear what type of thinking the researchers were refereeing to. Yet again, the results shown are specific differences between gifted and non-gifted youth, males and females, and even between ages of gifted youth, however, the uncertainty remains as to the root of such differences. Perhaps exploring the perspectives of common human development theories could aid in providing a clearer explanation.

Theoretical Perspectives

As theory is the driving force behind practice, this section will highlight how several theories would likely account for gifted youths abilities. Given the authors background in human development, the theories explored in this writing are limited to some common theories of the human development field. Subsequent sections will discuss how the literature and theory can be integrated into practice.

Social Information Processing Perspective

Social Information Processing Perspective (SIP) has emerged from the mechanistic world view as a way to predict how children learn. The idea is that mental activity can be attributed to the process of sensory input through symbols and structures (Klahr, 1989). In one explanation Dodge (1986), proposes that children engage in four mental steps of thinking and responding to cues. These are (a) encoding of situational cues, (b) representation and interpretation of those cues, (c) mental search for possible responses to the situation, and (d) selection of a response. Thus the view is that knowledge is not random activity, but can be predicted based upon how humans best meet each step in the process. Over time, our ability to process grows with experience. Nelson (1993) proposes that parents play a significant role in helping to regulate the development of processes. From his vantage point, parents are able to scaffold in these experiences by talking about what is going to happen, what is happening, and what previously had happened in different ways.

Sternberg also provides a helpful understanding of SIP. In his systems approach to intelligence, he proposes his triarchic theory of intelligence, and argues that intelligence is directed toward three goals. These are, (1) adaptation to the environment, (2) shaping of an environment, and (3) selection of an environment (Goldhaber, 2000). The difference in environments from person to person, and because the development of adaptation, selection, and shaping can differ in cultures, the nature of intelligence is significantly contextual. What is seen to be intelligent behavior is dependent upon what is valued as intelligent in a particular environment or culture. To Sternberg, we balance analytical abilities, creative abilities and practical abilities (Goldhaber, 2000). The more these abilities can complement each other, the greater one would be seen as intelligent in different contexts. Contextual environments emphasize the importance of each of these abilities, which in turn correlates with the ability for a child to develop these skills (Bain, Flanagan & Harrison, 2005). That is not to take from the mechanistic view of the information processing perspective, rather that the act of intelligence is done with a purpose and in a sequence, but the context in which this is done cannot be ignored.

Sternberg believes that intelligence measurement is best determined by the ability to handle new tasks and demands, and the ability to automatize them, thus effective measurement focuses beyond solely contextual factors. In more simple terms, a child may be able to complete a task easily in a familiar environment, but the ability to replicate the behavior in another location may differ. The ability to adapt and still perform highly in this new context would be a more appropriate measurement of intelligence from Sternberg's perspective. In fact, the ability to do so is what Sternberg notes as the determinant from the truly gifted to everybody else (Goldhaber, 2000). In an example, Sternberg, Clinkenbeard, and Zhang studied gifted children and found that their uniqueness is most evident on tasks requiring insightful behavior (Sternberg & Clinkenbeard, 1995; Sternberg & Zhang, 1995). Still, the exploration of the roots of how children are unique in this insightful behavior is quite limited. Therefore, while social information processing perspective is useful in predicting how children will learn through processes, it cannot be used as a theory to predict giftedness. Rather, the extent to which biological and social influences interact to aid in coding and processing of input may contribute to deeper intellectual abilities, yet it is unclear whether this predicts giftedness or further develops the already established abilities.

Social Cognitive Theory

Albert Bandura's social cognitive theory can also provide insight into the abilities of gifted youth. Bandura holds that knowledge is best acquired through our social learning experiences. The theory acknowledges the relationship between the person and biological, cognitive, and the external environment to influence learning. The ability to think about past experiences guides how we react to future events. Bandura describes learning capability in terms of regulating processes, which are: symbolizing capability, forethought capability, vicarious capability, self-regulatory capability, and self-reflective capability (Bandura, 1986). Following the mechanistic perspective of information processing, Bandura believes that over time the way in which we process information changes as we find new ways to accommodate the information through our social learning experiences (Goldhaber, 2000).

In the symbolizing capability process, Bandura believes that children learn though observational learning. They use words for representation of objects and experiences that are specific to their culture. Social learning experiences guide

the forming of culture-specific grammatical rules (Goldhaber, 2000). Following the emphasis on modeling in Bandura's theory, he notes the importance of parents playing a critical role in language acquisition. Parents can model more sophisticated language, provide feedback, rephrase sentences, question, inform, answer and label what is being talked about (Bandura, 1989). Doing so improves the child's language ability and will allow for improved intellectual ability and automatization.

Parental influence is also seen in the vicarious capability process. This process refers to learning through observing others. In as early as infancy, parents imitate behavior and the child learns that imitation is an effective way to maintain parental responsiveness. Parents attend to certain infant responses, thus the infant learns social interactions for representing information (Goldhaber, 2000). In a more practical sense, parents serve as motivators for having their child fit into cultural norms. Gender roles are a good example of this, as children learn the characteristics of being masculine or feminine primarily through parents. The degree to which a child exhibits more typical masculine or feminine characteristics is to some extent dependent on the vicarious reinforcement of cultural norms and modeling from the parents.

Forethought ability in children is important because it can serve as a motivator and director of a behavior (Goldhaber, 2000). As children develop the ability to think about how actions have consequences, it can either motivate them to do or not do something. Bandura believes this ability is developed through social experiences. Children eventually can link past experiences to what will likely happen in the future. It could be said then that as children are reinforced with the reasons why academics matter, the result would be that they are motivated to achieve more in school. Children see the benefits of learning and value it by modeling and following the lead of those close to them that do the same.

In the self-regulatory capability process Bandura argues that there are two processes within this capability. These are the motivational regulators and the moral and social regulators (Goldhaber, 2000). Motivational standards relate most closely with studying learning ability. Thorough motivational standards, we set standards for ourselves as to what we think we are able to accomplish. Our self-efficacy is the sense of if we can live up to the standards we have of ourselves (Goldhaber, 2000). Parents can play a vital role in helping shape the efficacy of their children. From a social cognitive perspective, if children have higher standards for themselves then they are likely to not give up when they do poorly on a task, but rather are motivated to improve to meet their personal expectations. Once this expectation is met, their standard is then raised to the next level. When children have role models to follow that have positive self-efficacy, those that view themselves positively and don't give up on the onset of failure, then the likelihood that they follow this lifestyle is high. Parents can provide remedial instruction, accompanied with modeling in order to foster a deeper internalization of high standards.

The self-reflective capability in regards to self-efficacy is key to human behavior. Reflecting on experiences allows for evaluation of thinking and the ability to alter it appropriately (Bandura, 1989). Being able to have control over the events that affect us is important in how we respond to them. We have the ability to make change in our lives as we see fit. This is important because it tells us that observation of a phenomenon doesn't mean there will be an automatic response. Instead, humans have the ability to process how they are going to use the information. Depending on ones efficacy, they may respond differently. If a child is at school and the teacher introduces a new concept that is difficult, the child has the ability to decide if they are going to seek more or less help in mastering the topic, or potentially give up. Children with a high self-efficacy would likely want to master the new task, thus making the choice to do so. It can then be seen how it is important it is to aid in children's development of this task.

Bandura would likely be highly critical of the *Center for Talented Youth* because of the programs ability grouping, which he believes instills a low sense of intellectual efficacy. In order for intellectual efficacy to be more highly developed, Bandura is supportive of individual instruction that allows children to compare their skills with their personal standards (Goldhaber, 2000). Rather than viewing CTY as a way to nurture gifted children's abilities in an environment that fosters academic and social development through inclusion of like peers, Bandura would likely focus on the competition

that he believes exists in these types of programs. It is this competition that he would view as an inappropriate educational practice as it is likely to instill a low sense of intellectual efficacy that is difficult to reverse once established.

Attachment Theory

Attachment theory posits that a bond exists between an infant and the primary caregiver, typically the mother (Bowlby, 1988). This bond has been shown to be important not only in general well-being (i.e., Kreppner & Ullrich, 1998), but also influences how relationships are formed and are successful across the lifespan (i.e., Waters, Merrick, Treboux, Crowell, & Albershein, 2000). While the caregiver attachment has been frequently explored, other research has made use of attachment theory to explain non-caregiver dyads. For example, research on interpersonal child-teacher relationships has utilized an attachment theory framework (i.e., Bowlby, 1973; Bowlby, 1980, & Bowlby, 1982). It seems logical to explore attachment influence on children's development given the close relationships they are likely to form with other adults. These adults can have a significant impact on a child's life thus impacting their development. Perhaps the most influential person in a child's life outside of her or his parents is the teacher. In fact, secure relationships with teachers may compensate for an insecure attachment relationship with the parent-child relationship (Van Ijzendoorn & Tavecchio, 1987). Perhaps this compensation is because the nature of the child-teacher relationship is in many respects similar to the parent-child relationship (Howes & Hamilton, 1992; Pianta, 1992). Connecting this relationship to academic achievement, findings suggest that children who have secure relationships with their teachers have been found to be more academically competent than those with insecure child-teacher relationships (Howes, Matheson, & Hamilton, 1994). Particularly, gifted students have been found to be even more affected by the interactions with their teachers than their non-gifted peers (Croft, 2003). Also discussed by Croft (2003) are several characteristics listed by the National Association for Gifted Children (NAGC) for successful teachers of gifted youth. NAGC suggests that the highly effective teacher is able to inspire and motivate, reduce tension and anxiety, and appreciate the high levels of sensitivity for gifted and talented youth (Croft, 2003).

Given the findings of the significance of attachment relationships, attachment theory would suggest that gifted youth could not have their abilities expressed without an attachment figure of some form in their lives. By contrast, the attachment figure most likely incorporated NAGC characteristics for effective teachers into the relationship regardless if they are the "school teacher." While the theory allows us to see the value of attachment figures in nurturing gifted youths abilities, it does not allow for a conclusion to be drawn on the causation of the abilities. Perhaps acquiring a secure attachment is one aspect of the development of gifted abilities, allowing for their expression, but it cannot be noted as the cause because we know of children with securely attached relationships, yet they are not academically gifted. That is, a secure attachment may aid in helping the gifted child reach her or his full potential, but it doesn't create the ability. Further research is needed to explore how the intensity of securely attached relationships correlates with the level of abilities within the gifted youth population. For example, does having multiple secure relationships allow for further expression of abilities?

Attachment theory fits excellently into ways to support gifted children's abilities, yet the theory is unable to explain the roots of such abilities. From this, it is unsafe to say that securely attached relationships forecast gifted abilities, rather children with securely attached relationships have an increased likelihood of expressing their gifted abilities while also having them nurtured, and thus further aiding in the child to master her or his full potential.

Behavioral Genetics Theory

A behavioral geneticist perspective of the roots of gifted youth abilities would be a biological explanation. That is, the stance would be that the child was born with her or his gifted abilities. Many studies have addressed the genetics of brain structure and intelligence by behavioral geneticists (i.e., Toga, & Thompson, 2005; Deary, Spinath, & Bates, 2006; Deary, Penke, & Johnson, 2010). In one particular study, major white matter fiber pathways were found to be highly genetically controlled, and diffusion anisotropy was linked with advanced intellectual performance in many key systems. Researchers hope that these results may lead to future studies to distinguish individual genes contributing to fiber architecture, white matter integrity and cognition (Chiang, et al., 2009). These results show evidence of gene correlation

with intelligence which comes close to answering the question of this writing regarding the roots of gifted abilities. Yet although the results show evidence of gene correlation with intelligence, there is no mention of the contributing factors that allow expression of the gene, or phenotype. Given this, it is important to look to the other explored theories to explain how they interact to forecast gifted ability.

While this research is in its infancy, it is providing crucial insight into understanding biological influences on intellectual ability, and future research of brain structure of gifted children may provide more clarity on such roots of intelligence.

Integrating Practice

The above theoretical perspectives provide frameworks for which to explore the roots of gifted children's unique academic abilities, yet none can directly answer the question as to the causation of the abilities. By comparison, when researchers explore the similarities and differences within gifted children (e.g., sex differences, parenting styles, self-perception, perfectionism, personality and learning styles, birth order, and cultural context) the results merely show differences within the already talented population. Thus, while similarities and differences are provided, the answer for the cause of the differences is lost. Despite the lack of a single theory or characteristic to define the roots of the abilities, what may be more reasonable is to explain how the interaction of such perspectives and individual child characteristics further increase the likelihood of the abilities being identified. Doing so will allow for the child to express her or his abilities, allowing those that work with gifted youth to properly nurture and help them reach their full potential.

The Johns Hopkins University *Center for Talented Youth* program is an excellent example of how research of gifted youth has been integrated into practice. The goal of this program is to nurture gifted children's intellectual abilities, enhance their personal development, and foster better understanding of the needs of the talented youth (Center for Talented Youth, n.d.). CTY utilizes a strong research component in order to evaluate the overall effectiveness of the program, as well to ensure the proper nurturing of the whole child from both an academic and social perspective. Hence both academic and residential staffs understand that not all gifted children are the same, as they come from many diverse backgrounds and have thus had different experiences. CTY professionals realize that because of the diversity of their students, they will have likely had differences in parenting styles, learning styles, birth order, cultural expectations, etc. All of which would then have likely impacted the degree of secure attachment relationships, experiences that were observed and modeled, how information is processed, and structuring of the brain. As a senior residential administrator for the *Center for Talented Youth*, the author now explores his experiences of how theory has informed professional practice of the summer program.

CTY and Social Information Processing Perspective

CTY academic and residential staffs play a significant role in aiding in the development of processes. As mentioned, Nelson (1993) proposes that parents are able to scaffold in these experiences by talking about what is going to happen, what is happening, and what previously had happened in different ways. Similarly, CTY staff aid in the development of these processes through explaining to the children expectations in the classroom and in the residential halls. Residential and academic staffs collaborate to maintain consistency of expectations. Thus, there is no confusion with why things are happening, why they did happen, or why something will happen in the future. Doing so supports Dodge (1986), perspective that children engage in four mental steps of thinking and responding to cues. As children (a) encode situational cues, (b) represent and interpret of those cues, (c) do a mental search for possible responses to the situation, and (d) select of a response, they will have a better development of processing thoughts and knowledge (Goldhaber, 2000). CTY professionals scaffold in this thinking process. As mentioned, Sternberg theorizes that we balance analytical abilities, creative abilities and practical abilities (Goldhaber, 2000). The high complementation with these abilities correlates positively with ones level of intelligence. CTY integrates the balance of these abilities within its program through academic staff that encourage logical and abstract thinking, and residential staff that develop activities to aid in the development of creative and practical thinking, through directive and non-directive play.

CTY and Social Cognitive Theory

As previously stated, Bandura is supportive of individual instruction that allows children to compare their skills with their personal standards (Goldhaber, 2000). Due to this, Bandura would likely be critical CTY grouping children together because of the possibility for competition to exist between these children which could decrease their intellectual-efficacy. On the contrary, an exhaustive body of literature disregards Banduras perspective and is quite grounded in the benefits of grouping gifted children (i.e., Brody, 2004; Fiedler, Lange, & Winebrenner, 2002; Kulik, 1992; Loveless, 1998; Rogers, 2006; Rogers, 2002, & Tieso, 2003) for examples. These studies show evidence that children learn best from peers that learn and think in ways similar to themselves. However it is not the act of being grouped that in itself is beneficial. Rather, what educators do to nurture the gifted children within this group is crucial. Thus, while Bandura may disagree with ability grouping, perhaps he may be able to compromise on how CTY professionals nurture giftedness within the group.

In an example, it was previously stated that Bandura believes that the way in which we process information changes over time as we find new ways to accommodate the information through our social learning experiences (Goldhaber, 2000). Social learning experiences are at the heart of the CTY experience for the children enrolled in the program. CTY staff works to foster a comfortable, safe and all inclusive family like atmosphere within its programs. This is done through social learning experiences in the academic setting and residential setting. CTY believes that nurturing the full potential of the children they serve could not be accomplished without providing opportunity for exceptional social learning experiences.

Further supporting social cognitive theory, CTY staff understands the importance for the children to have reflection time. Reflecting on experiences allows for evaluation of thinking and the ability to alter it appropriately (Bandura, 1989). CTY professionals speak with students about experiences they are having in the classroom as well as outside of the classroom, especially since what will happen in one setting will likely impact the other. Staff members also hold interdisciplinary team meetings to reflect on the experiences the children are having in order for all professionals to be on the same page for modeling consistency in practice.

In addition, it would be difficult for Bandura to dispute the claim that CTY improves the self-efficacy of the children they serve. Using a strength-based approach, CTY professionals nurture the child's gifted abilities through providing rigorous academia to match the child's academic ability. Further, CTY provides opportunities for students to develop in other ways that they perhaps were not so confident in prior to coming to a CTY program. Through rapport building CTY professionals are able to get to know the students they work with quite well, which allows for the staff members to be in tune with areas in which their students could improve. For instance if a CTY Resident Assistant notices that one of her students is excelling in the classroom yet is struggling socially with other students, the professional is likely to provide opportunity and encouragement of the child to be included with other children. Over time, the goal is that the student's efficacy of making friends will increase.

CTY and Attachment Theory

Center for Talented Youth Students form close relationships with their teachers, teaching assistants, resident assistants, and fellow peers. These relationships influence their ability to learn and form future relationships as they leave the program. CTY is familiar with the earlier presented findings that gifted students are even more affected by the interactions with their teachers than their non-gifted peers (Croft, 2003). CTY provides such a place for gifted students to be nurtured by a team of professionals and peers that they form interact and form close relationships with. As mentioned, children who have secure relationships with their teachers have been found to be more academically competent than those with insecure child-teacher relationships (Howes, Matheson, & Hamilton, 1994). CTY professionals would agree with this finding and go even further in saying that it provides validity for CTY given that CTY further strengthens the gifted child's relationship with teachers, which could correlate to continued future academic competence.

CTY and Behavioral Genetics

The Center for Talented Youth recognizes that gifted children's brains have unique abilities. While CTY recognizes that its students are not merely "little adults," they also recognize that these children have a unique ability for understanding adult academic rigor. That is, CTY recognizes that its students are behaviorally and cognitively still children, while also recognizing and nurturing the aspect of their academic ability that is superior to their same age counterparts. While the brains of CTY children are able to be superior in some academic aspects, CTY professionals would argue that the phenotypes of these genotype abilities would not be possible without nurture. Gifted children are just as at risk of not reaching their full potential as other children are of dropping out of school (Ybarra, 2009). The theories previously mentioned can fit within the behavioral genetics perspective if one considers that that the theories can be combined to provide a framework for helping the gifted child to express her or his biological abilities.

Conclusion

This writing has explored literature regarding academically gifted and talented youth, and common human development theoretical perspectives that might explain the roots of such abilities. This review provided findings from gifted youth gender differences, parenting style influences, self-perception, personality and learning styles, birth order and cultural influences. While the findings of the studies show variation of differences between the listed variables, they do not show for a direct moderation of gifted ability. Likewise, the human development theories of social information processing perspective, social cognitive, and attachment rendered results that could be used at most to help nurture children with their gifted abilities, but they fail to explain the causation. The closest theory found to explain the roots of gifted abilities is behavioral genetics. This biological perspective is providing a unique insight into brain structure to explain intelligence. The theory is different than the others mentioned in that it is able to show links between the brain and intelligence. For instance a 2009 study revealed that, major white matter fiber pathways were found to be highly genetically controlled, and diffusion anisotropy was linked with advanced intellectual performance in many key systems (Chiang, et al., 2009). While the other mentioned theories can be used to explain how to properly nurture gifted children, they do not provide sufficient links between utilizing the theory to show causation of the abilities in a way that behavioral genetics does.

In providing a direction for future research, studies should explore the extent to which the other mentioned human development theories can account for roots of gifted abilities. For example, how much modeling and observation accounts for acquiring gifted ability vs. does having the genotypes for advanced intellectual capability allow for further expression of these genes through observation and modeling? Similar nature vs. nurture questions could be formed with social information processing perspective and attachment theory to further inform practice.

The Johns Hopkins University *Center for Talented Youth* program was also explored in this writing as a way to show an example of theory being applied to practice in the realm of gifted children. The author provided examples of how CTY has utilized social information processing perspective, social cognitive, attachment and behavioral genetics as a way to nurture its gifted students. Although there is mention of the prevalence of gifted youth educational programs worldwide, details of these models in comparison to CTY and their theoretical groundings was left unexplored.

The author speculates that there is no sole causation of gifted abilities, but rather the combination of biological and social theories are contributors that can be combined in a way to better forecast giftedness. It is thought here that the degree to which gifted abilities are expressed are because of how well they are nurtured through social information processing, social cognitive theory, and attachment. Yet, argued here is that nurturing these abilities would not be possible without the child first providing the readiness to learn at a higher level. The child's brain must be developed in a way that allows them to learn at the sophisticated level, without adult pressure and high expectations.

Further, the author disregards any arguments that any racial or ethnic group is biologically smarter than another, and agrees with a 2007 study that suggests there is an over-representation of ethnic minority students (Chinese, Indian and mixed ethnicity) in gifted classification because of these groups affluence rather than ethnicity (Campbell, et al., 2007).

That is because of their wealth, these ethnic groups likely have more resources available to them to aid in their educational attainment, thus allowing for certain ethnic groups to be overrepresented in the gifted status. This then provides explanation for why some lower class ethnic groups are not well represented in the gifted status, and further provides evidence that resources must be available to nurture the gifted child's abilities. Without support of these abilities, they are likely to fade because they have not been nurtured in a way that allows for full developmental potential. Further research would benefit from comparison of brain scans of children from different cultural educational practices. An example could be to see if different educational practices render differences in children's brains, and if these educational practices structure the brain in such a way to allow for a higher order of thinking. This would allow for a distinction between educational practices that lead to or "teach" giftedness, or if these educational practices better support the child in her biological abilities.

Also not explored in this review is the impact of early adversity on children's development. Future researchers may wish to explore gifted children that had experienced early adversity compared to their gifted peers that had not, in a way to explain differences in brain development. Likewise, such research would be beneficial for explaining the importance of positive early experiences that impact the child across the lifespan. Further, one may wish to explore correlations between academic achievement and other talents (e.g., musical, athletic, etc.) to determine the degree to which one may impact the other as this was not explored here. It should also be emphasized that although the author explored many relevant theoretical perspectives to aid in the explanation of gifted youths' abilities, one should not limit the ways to explain gifted abilities to the theories presented here. Future reviews and studies should explore a variety of perspectives in order to best explain the roots of such abilities.

It is evident throughout this review that it is not always possible to explain phenomena with a single explanation. Multiple contextual factors linking research, theory and practice must be considered when attempting to provide best practice explanation for why something occurs. Without researchers and practitioners making the connections between theoretical perspectives, research and practice, the result is a limited understanding of what is trying to be explained. Such connections provide a lens for which to understand a phenomenon in the most valid manner. Therefore as researchers continue to explore the roots of academically precocious youth, they must consider all theoretical approaches to best guide their studies and to show for all factors that may contribute to gifted abilities.

Biodata of Auhor

Justin M. Petkus is Certified Child Life Specialist (CCLS); Certified Family Life Educator (CFLE); Registered Psychologist (Luxembourg) and Doctoral Candidate: University of Luxembourg, Department of Behavioural and Cognitive Sciences. Adjunct Assistant Professor: Miami University, Department of Family Science and Social Work, John E. Dolibois European Center. Email: justin.petkus@uni.lu ORCID: 0000-0002-3179-1904

References

Ablard, K. E. (1997). Self-perceptions and needs as a function of type of academic ability and gender. *Roeper Review*, *20*(2), 110-115.

Ablard, K. E., & Mills, C. J. (1996). Implicit theories of intelligence and self-perceptions of academically talented adolescents and children. *Journal of Youth and Adolescence*, *25*(2), 137-148.

Ablard, K. E., & Parker, W. D. (1997). Parents' achievement goals and perfectionism in their academically talented children. *Journal of Youth and Adolescence*, *26*(6), 651-667.

Ablard, K. E. (2002). Achievement goals and implicit theories of intelligence among academically talented students. *Journal for the Education of the Gifted*, *25*(3), 215-232.

Bain, S. K. (2008). Flanagan, DP, & Harrison, PL (Eds.).(2005). Contemporary Intellectual Assessment—Theories, Tests, and Issues New York: Guilford Press.

Bandura, A. (1986). Social foundations of thought and action. *Englewood Cliffs, NJ*.

Bandura, A. (1989). Social cognitive theory. In R. Vasta (Ed.), *Annals of child development* (Vol. 6, pp. 1-60). Greenwich, CT: JAI Press.

Blackburn, C. C., & Brody, L. E. (1994). Family background characteristics of students who reason extremely well mathematically and/or verbally. In *Talent development* (Vol. 2, pp. 439-444). Dayton, OH: Ohio Psychology Press.

Bowlby, J. (1973).Attachment and loss: Separation, anxiety, and anger. New York: Basic Books.

Bowlby, J. (1980).Attachment and loss: Vol. 3. Loss: Sadness and depression. New York: Basic Books.

Bowlby, J. (1982).Attachment and loss: Attachment(rev. ed.). New York: Basic Books. (Original work published 1969).

Bowlby, J. (1988). A secure base. New York: Basic Books.

Brody, L. E., Barnett, L. B., & Mills, C. J. (1994). Gender differences among talented adolescents. In *Competence and responsibility. The Third European Conference of the European Council for High Ability* (pp. 204-210).

Brody, L. E., & Reis, S. M. (Eds.). (2004). *Grouping and acceleration practices in gifted education*. Corwin Press.

Campbell, R. J., Muijs, R. D., Neelands, J. G. A., Robinson, W., Eyre, D., & Hewston, R. (2007). The social origins of students identified as gifted and talented in England: a geo-demographic analysis. *Oxford Review of Education*, *33*(1), 103-120.

Chao, R. K. (1994). Beyond parental control and authoritarian parenting style: Understanding Chinese parenting through the cultural notion of training. *Child development*, *65*(4), 1111-1119.

Chiang, M. C., Barysheva, M., Shattuck, D. W., Lee, A. D., Madsen, S. K., Avedissian, C., & Wright, M. J. (2009). Genetics of brain fiber architecture and intellectual performance. *Journal of Neuroscience*, *29*(7), 2212-2224.

Croft, L. J. (2003). Teachers of the gifted: Gifted teachers. *Handbook of gifted education*, *3*, 558-571.

Deary, I. J., Spinath, F. M., & Bates, T. C. (2006). Genetics of intelligence. *European Journal of Human Genetics*, *14*(6), 690.

Deary, I. J., Penke, L., & Johnson, W. (2010). The neuroscience of human intelligence differences. *Nature reviews neuroscience*, *11*(3), 201.

Dodge, K. A. (2014). A social information processing model of social competence in children. In *Cognitive perspectives on children's social and behavioral development* (pp. 85-134). Psychology Press.

Durden, W. G., Mills, C. J., & Barnett, L. B. (1990). Aspects of gender differentiation in the Johns Hopkins University Center for Talented Youth. *Highly talented young women*, 166-185.

Durden, W. G., & Mills, C. J. (1993). Talent derailed: the education establishment's assault on ability grouping. *Wisconsin Interest*, *2*(1), 43-50.

Dwairy, M. (2004). Parenting styles and mental health of Arab gifted adolescents. *Gifted child quarterly*, *48*(4), 275-286.

Fiedler, E. D., Lange, R. E., & Winebrenner, S. (2002). In search of reality: Unraveling the myths about tracking, ability grouping, and the gifted. *Roeper Review*, *24*(3), 108-111.

Brody, L., Fox, L. H., & Tobin, D. (1980). *Women and the Mathematical Mystique: Proceedings of the Eighth Annual Hyman Blumberg Symposium on Research in Early Childhood Education: Expanded Version of a Symposium of the American Association for the Advancement of Science Entitled 'Women and Mathematics'*. Vol. 5. Johns Hopkins University Press.

Goldhaber, D. (2000). *Theories of human development: Integrative perspectives*. McGraw-Hill Humanities, Social Sciences & World Languages.

Howes, C., & Hamilton, C. E. (1992). Children's relationships with caregivers: Mothers and child care teachers. *Child development*, *63*(4), 859-866.

Howes, C., Matheson, C. C., & Hamilton, C. E. (1994). Maternal, teacher, and child care history correlates of children's relationships with peers. *Child development*, *65*(1), 264-273.

Ireson, J., & Hallam, S. (2009). Academic self-concepts in adolescence: Relations with achievement and ability grouping in schools. *Learning and Instruction*, *19*(3), 201-213.

Klahr, D. (1989). Information-processing approaches. *Annals of child development*, *6*, 133-185.

Kreppner, K., & Ullrich, M. (1998). Talk to mom and dad, and listen to what is in between: A differential approach to family communication and its impact on adolescent development. In *Verbal interaction and development in families with adolescents* (pp. 83-108). Ablex.

Kulik, J. A. (1992). An Analysis of the Research on Ability Grouping: Historical and Contemporary Perspectives. Research-Based Decision Making Series.

Loveless, T. (1998). The Tracking and Ability Grouping Debate. Volume 2, Number 8.

Lubinski, D., & Benbow, C. P. (1992). Gender differences in abilities and preferences among the gifted: Implications for the math-science pipeline. *Current Directions in Psychological Science*, *1*(2), 61-66.

McCrae, R. R., Costa Jr, P. T., Terracciano, A., Parker, W. D., Mills, C. J., De Fruyt, F., & Mervielde, I. (2002). Personality trait development from age 12 to age 18: Longitudinal, cross-sectional and cross-cultural analyses. *Journal of personality and social psychology*, *83*(6), 1456.

Mills, C. J., & Bohannon, W. E. (1980). Personality characteristics of effective state police officers. *Journal of Applied Psychology*, *65*(6), 680.

Mills, C. J. (1981). Sex roles, personality, and intellectual abilities in adolescents. *Journal of Youth and Adolescence*, *10*(2), 85-112.

Mills, C. J. (1983). Personality characteristics of gifted adolescents and their parents: Comparisons and implications for achievement and counseling.

Mills, C. J., & Tangherlini, A. E. (1991). Finding the optimal match: Another look at ability grouping and cooperative learning. *Equity & Excellence in Education*, *25*(2-4), 205-208.

Mills, C. J., & Durden, W. G. (1992). Cooperative learning and ability grouping: An issue of choice. *Gifted Child Quarterly*, *36*(1), 11-16.

Mills, C. J. (1993). Personality, learning style and cognitive style profiles of mathematically talented students. *European Journal of High Ability*, *4*(1), 70-85.

Mills, C. J., Moore, N. D., & Parker, W. D. (1996). Psychological type and cognitive style in elementary-age gifted students: Comparisons across age and gender. *Journal of Psychological Type*, *38*, 13-23.

Mills, C. J., Ablard, K. E., & Stumpf, H. (1993). Gender differences in academically talented young students' mathematical reasoning: Patterns across age and subskills. *Journal of Educational Psychology, 85*(2), 340-346.

Mills, C. J., & Parker, W. D. (1998). Cognitive-psychological profiles of gifted adolescents from Ireland and the US: Cross-societal comparisons. *International Journal of Intercultural Relations*, *22*(1), 1-16.

Nelson, K. (1993). Events, narratives, memory: What develops. In *Memory and affect in development. The minnesota symposia on child psychology* (Vol. 26, pp. 1-24). Hillsdale, NJ: Erlbaum.

Oakland, T., Joyce, D., Horton, C., & Glutting, J. (2000). Temperament-based learning styles of identified gifted and nongifted students. *Gifted Child Quarterly*, *44*(3), 183-189.

Parker, W. D., & Adkins, K. K. (1995). Perfectionism and the gifted. *Roeper review*, *17*(3), 173-175.

Parker, W. D. (1998). Birth-order effects in the academically talented. *Gifted Child Quarterly*, *42*(1), 29-38.

Parker, W. D., & Stumpf, H. (1998). A validation of the five-factor model of personality in academically talented youth across observers and instruments. *Personality and Individual Differences*, *25*(6), 1005-1025.

Pianta, R. C. (1992). Conceptual and Methodological Issues in Research on Relationships between Children and Nonparental Adults. *New directions for child development*, *57*, 121-29.

Preckel, F., Götz, T., & Frenzel, A. (2010). Ability grouping of gifted students: Effects on academic self-concept and boredom. *British Journal of Educational Psychology*, *80*(3), 451-472.

Robinson, J. P. (2008). Evidence of a differential effect of ability grouping on the reading achievement growth of language-minority Hispanics. *Educational Evaluation and Policy Analysis*, *30*(2), 141-180.

Rogers, K. B. (2002). *Re-forming gifted education: Matching the program to the child*. Great Potential Press, Inc.

Rogers, K. B. (2006). *A menu of options for grouping gifted students*. Prufrock Press Inc.

Runco, M. A., & Okuda, S. M. (1993). Reaching creatively gifted children through their learning styles. *Teaching and counseling gifted and talented adolescents: An international learning style perspective*, 103-115.

Steinberg, L., Darling, N. E., Fletcher, A. C., Brown, B. B., & Dornbusch, S. M. (1995). Authoritative parenting and adolescent adjustment: An ecological journey. *Examining lives in context: Perspectives on the ecology of human development*, *63*, 2-3.

Sternberg, R. J., & Clinkenbeard, P. R. (1995). The triarchic model applied to identifying, teaching, and assessing gifted children.

Sternberg, R. J., & Zhang, L. F. (1995). What do we mean by giftedness? A pentagonal implicit theory. *Gifted Child Quarterly*, *39*(2), 88-94.

Stumpf, H. (1995). Gender differences in performance on tests of cognitive abilities:

Experimental design issues and empirical results. *Learning and Individual Differences*, *7*(4), 275-287.

Tieso, C. L. (2003). Ability grouping is not just tracking anymore. *Roeper Review*, *26*(1), 29-36.

Toga, A. W., & Thompson, P. M. (2005). Genetics of brain structure and intelligence. *Annu. Rev. Neurosci.*, *28*, 1-23.

Tsui, J. M., & Mazzocco, M. M. (2007). Mathematics and perfectionism: Effects of math anxiety and perfectionism on timed versus untimed math testing in mathematically gifted sixth graders. *Roeper Review*, *29*(2), 132-139.

Van Ijzendoorn, M. H., & Tavecchio, L. W. (1987). The development of attachment theory as a Lakatosian research program: Philosophical and methodological aspects. In *Advances in Psychology* (Vol. 44, pp. 3-31). North-Holland.

Waters, E., Merrick, S., Treboux, D., Crowell, J., & Albersheim, L. (2000). Attachment security in infancy and early adulthood: A twenty-year longitudinal study. *Child development*, *71*(3), 684-689.

Ybarra, L. (Producer). (2009, June). Center for talented youth [Audio Podcast]. *Johns Hopkins University "Great Ideas"*. Retrieved from http://www.jhu.edu/news/podcasts/mp3/ctyfinal0625.mp3