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Examining Behavioral Reactivity and Cognitive Differences within the CHC Theory of Intelligence Among Children.

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Abstract

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Steven M. Jozwiak

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Linking cognition and behavior has long been an area of interest to the field of psychology in its endeavors to understand what innate factors influence human behavior. To date, the majority of research linking emotional reactivity to cognition has focused on single areas of intellectual functioning on specific diagnostic profiles or learning disorders rather than a comprehensive comparison to cognitive profile typology. Nearly all the research conducted to date continues to define cognition and emotion as disparate entities, rather than exploring a more integrated view of emotion and cognition. The purpose of this quantitative study was to examine cognitive profile differences among children with internalizing versus externalizing profiles of emotional reactivity in terms of Cattell-Horn-Carroll theory constructs as measured by the Wechsler Intelligence Test for Children, Fourth Edition [WISC-IV]. A cognitive-behavioral approach was used in conducting a secondary analysis of BASC2 and WISC-IV composite scores from a limited data set of 128 male and female students 6-16 years of age obtained from a local public school district. Results of paired-sample *t* tests indicated that the VCI was significantly higher for the BASC2 internalizing group (t =3.063, p < .05, two-tailed), suggesting the existence of distinct verbal cognitive skillsets among groups. This study contributes to social change by providing information to researchers and practitioners about cognitive differences among children with internalizing and externalizing behaviors that may lead to more effective cognitive-behavioral research and intervention strategies.

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Chapter 1

Introduction

Linking cognition and behavior has long been an area of intense interest to the field of psychology, and the clinical, social, and organizational applications of the relationship between these factors has been thoroughly researched and documented. More specifically, over the past 70 years, the field of psychology has endeavored to establish the methods of quantitatively analyzing the structural components of intelligence, and behavior, as well as the integration of these two elements within the context of human development. To date, the majority of research linking emotional reactivity to cognition has focused on single areas of intellectual functioning (Kunzmann & Richter, 2009), or to specific diagnostic profiles or learning disorders (Filippatou, Dimitropoulou, & Sideridis, 2009) rather than a comprehensive comparison to cognitive profile typology, and nearly all the research conducted to date continues to define cognition and emotion as disparate entities, rather than exploring a more integrated view of emotion and cognition instead (Dennis,2010).

The purpose of this study is to examine several of the broad factors of Cattell-Horn-Carroll CHC theory as measured by the Wechsler Intelligence Scale for Children – 4th edition [WISC-IV] and whether differences exist between internalizing versus externalizing profiles on the Behavior Assessment Scale for Children – 2nd Edition [BASC2] in children between 6-16 years of age. Based on similar methodology from McKenna-Mattson (2005) it is important to clarify the difference

between the broader term “cognition” used in that study, which refers to the integration of a complex series of biological and learned mental processes used to analyze and synthesize cognitive events, and the more specific, structural components of human reasoning and problem-solving defined as “intelligence” which is the focus of the current study**.**

Background

The correlation between behavior and cognition has been well-researched. However, to date, the majority of research linking emotional reactivity to cognition has focused on single areas of intellectual functioning (Kunzmann & Richter, 2009), or to specific diagnostic profiles or learning disorders (Filippatou, Dimitropoulou, & Sideridis, 2009) rather than a comprehensive comparison to cognitive profile typology.

In one example, Kunzmann and Richter (2009) studied emotional reactivity [ER] in adults using matrices test (logical reasoning), and pragmatic cognitive skill. Their results suggested that ER was not significantly correlated with logical reasoning, but may be linked with other areas not assessed such as working memory or processing speed. ER was also not linked to age specifically, but more to pragmatic cognition/age-relevance of emotional indicators. High pragmatic intelligence moderated ER for all ages, while low pragmatic intelligence resulted in higher ER as age increased, which suggested that other areas of intelligence by be involved in moderating ER.

In another project, Timbremont and Braet (2005) conducted an experimental study focusing on recall and encoding cognitive strategies in depressed versus non-

depressed children. While intellectual level did not have a significant relation to depressive symptoms, the introduction of other-referent stimuli had significant impact on equalizing recall ratios of positive versus negative information for both groups. This provided evidence that indicated cognitive or intellectual differences existed in children with internalizing behavioral profiles.

Similarly, an experimental study that tested the relation of working memory to preventing the intrusion of negative stimuli in individuals with major depression seemingly supported the notion that internalizing behavior may affect, or be affected by, cognitive functioning (Joormann, Jutta, & Gotlib, 2008). Results indicated that adults with major depression have difficulty preventing the filtering of intrusive negative words and subsequent rumination on negative thoughts, not only supporting the notion that a correlation exists between internalizing behavior and cognition, but that this behavioral typology may in fact be related to the verbal processes of intelligence.

Interestingly, a study by Filippatou, Dimitropoulou, and Sideridis (2009) compared intellectual and behavioral profiles on two groups of students with learning disabilities or language disabilities. Their results indicated that no significant differences were found on emotional pathology between groups despite cognitive differences between them, lending further support to Joorman, Jutta, and Gotlib (2009) in providing evidence linking verbal intelligence to emotional (internalizing) behavior.

Statement of the Problem

There is a problem in the differential diagnosis and treatment of social-emotional disorders in children. Despite improvements in standardized report measures that attempt to differentiate internalizing versus externalizing emotional reactivity in children, little has been done in the way of delineating these two very different types of emotional reactivity in relation to cognition. In fact, the majority of research linking emotional reactivity to cognition has focused on single areas of intellectual functioning (Kunzmann & Richter, 2009), or to specific learning disorders (Filippatou, Dimitropoulou, & Sideridis, 2009) rather than a comprehensive comparison to cognitive profile typology.

Purpose of the Study

The purpose of this quantitative study is to examine cognitive profile differences on the Wechsler Intelligence Test for Children, Fourth Edition [WISC-IV] (Wechsler, 2003) for children with internalizing versus externalizing profiles of emotional reactivity. Behavioral reactivity has been defined in terms of the average rater score for children who exhibit primarily internalizing behavior versus externalizing behavior as measured by the Behavior Assessment System for Children, Second Edition [BASC2] (Reynolds & Kamphaus, 2004). Children who exhibit internalizing social-emotional disorders often receive different, and in many cases more extensive interventions and services than those with externalizing behavioral difficulties or disorders. The implications for this study relate to identifying differences, strengths, and limitations of current social and emotional programs and therapies utilized for these two populations, and seeks to develop

understanding of cognitive differences between these groups can lead to better cognitive-behavioral interventions.

Research Questions

1) Do verbal processes on the WISC-IV show greater variability in children with internalizing than externalizing behaviors?
2) Do the nonverbal processes on the WISC-IV show greater variability in externalizing than internalizing behavioral profiles?
3) Does the nature of executive or automatic processes, such as working memory and processing speed differ between groups?

Hypotheses

The overall intellectual profiles of children on the WISC-IV with internalizing versus externalizing behavioral profiles on the BASC2 will reflect significant differences. The null hypothesis is that no differences exist between any of the 4 cognitive composite areas on the WISC-IV between groups. The specific testable hypothesis are: (1) There will be significantly higher VCI scores on the WISC-IV for individuals in the Internalizing group compared to the Externalizing group, (2) There will be significantly higher PRI scores on the WISC-IV for the Externalizing group compared to the Internalizing group, (3) The internalizing group will have higher WMI scores than the Externalizing group, and finally (4) PSI will be higher in the Externalizing group compared to the Internalizing group.

Theoretical Framework

In order to address effective treatment of social-emotional difficulties in children, it is necessary to know more about the differences between internalizing versus externalizing profiles from a more comprehensive cognitive-behavioral framework. Recent research (Timbremont & Braet, 2005) has focused on understanding the link between cognition and social-emotional functioning, but very little has been done to examine more specific subsets of social-emotional disparity. Furthermore, current research (Dennis, 2010) suggested that cognition and behavior are far more integrated that previously theorized. A study that compares these two categories of behavioral reactivity as measured by the BASC 2 to a comprehensive cognitive profile such as the WISC-IV will help in clarifying whether significant profile differences exist that may assist mental health practitioners in developing more effective interventions for these two groups.

Nature of the Study

This proposed design for this study is a non-experimental, secondary data analysis of an existing dataset. Data will be matched to one of two groups of students who exhibited primarily internalizing patterns versus externalizing patterns on the Behavior Assessment Scale for Children, Second Edition [BASC2], who have also been administered the Wechsler Intelligence Scale for Children, Fourth Edition. WISC-IV composite and index scores will be compared between the BASC2 groups to determine if significant differences exist between the profiles for these two groups in relation to cognitive reasoning and processes. The population for this study will include 80-100 students in Alaska between the ages of 6-16, and from various ethnic backgrounds, who have previously been administered both the

BASC 2 and WISC-IV. Information will be gathered from an existing database of students from local school districts. Examples of research data that may be collected include WISC-IV profile and index scores, BASC-2 profile and index scores, and information on gender, ethnic, and age range of students in the dataset. No personally identifiable information on students will need to be collected for the purposes of this study.

Definitions

Behavior Assessment System for Children – 2nd Edition [BASC2]	Multi-dimensional measure of behavior for children ages 2 through 25 years of age. Provides standardized reporting of behavioral observations by parents and teachers, as well as via self-report forms for older children (Reynolds & Kamphaus, 2004)
Externalizing Behavior	Behaviors that are characterized as disruptive behaviors, such as aggression, hyperactivity, and delinquency (Reynolds & Kamphaus, 2004)
Internalizing Behavior	Behaviors that are differentiated from Externalizing because they are not characterized by "acting out". Highly related to emotionality such as anxiety and depression symptomology (Reynolds & Kamphaus, 2004).
Wechsler Intelligence Scale for Children – 4th Edition [WISC-IV]	An individually-administered measure of intelligence for children ages 6-16 years of age (Wechsler, 2003).
Full Scale Intelligence Quotient [FSIQ]	Indicator of general, overall cognitive ability (Wechsler, 2003).
Verbal Comprehension	Language-based measure of verbal reasoning, verbal concept formation, and

	acquired knowledge (Wahlstrom et al., 2012)
Perceptual Reasoning	Spatial thinking, visual-motor integration, and ability to problem-solve (Wahlstrom et al., 2012)
Working Memory	Capacity to temporarily store and use recently presented information to achieve a goal (Wechsler, 2003).
Processing Speed	Ability to perform simple cognitive tasks quickly (Mather & Wendling, 2012)
CHC Theory	Theoretical framework of how people process information cognitively. Defines intelligence as a cluster of broad components composed of many narrower abilities (McGrew, 2005).

Assumptions

Given the nature of this study as a secondary data analysis, it is assumed that all tests were administered and scored by individuals adequately trained and qualified to perform those duties. It is also assumed that the individuals who completed the child behavior rating scales (BASC2) were provided sufficient instruction in how to fill the forms out correctly.

Scope and Limitations

The scope of this study is limited to the comparison of the WISC-IV and BASC2 scores available through a local school district in Southeast Alaska. While representative of the region, the generalizability of any results of this study may be limited to this geographical and cultural locale due to the fact that this area is not necessarily representative of many of the areas in which the instruments compared in this study are employed or available for use.

Significance

Need for a study of this scope has been well documented in the research literature. While both internalizing and externalizing behavioral reactivity, as well as cognitive ability in relation to this arena has been examined to various degrees, most if not all the available literature has taken into account only specific aspects of behavior or intelligence (Joorman & Gotlib, 2008; Greenbaum et al., 2009), or generalized views of both (van Nieuwenhuijzen et al., 2009), rather than a comprehensive study than compares both broad and narrow factors of cognition and behavioral reactivity within a single design.

In their research examining inter-rater reliability of behavioral observations as an indicator of intelligence, Borkenau et al. (2004) found relatively high correlation coefficients for inter-rater estimates of intelligence based on thin slices of video-based behavioral observation. Their results emphasized the need for further exploration of cross-examining intelligence and behavioral indicators. Similarly, Fiorello et al. (2007) compared intellectual functioning among groups of children with various cognitive or behavioral disabilities using the WISC-III. Similarities of general intelligence scores between groups suggested that it may be more important to look at cognitive index scores rather than global FSIQ as a means of comparing internalizing versus externalizing behavioral profiles. In a similar but more specific study design that examined verbal and nonverbal cognitive abilities in individuals with high-functioning autism, Black et al. (2009) reported that higher verbal IQ with lower nonverbal VIQ may be associated with social behavioral

difficulties. Researchers suggested future research that explores IQ discrepancies as important marker in autism and possibly other social-behavioral disorders.

Summary

In summary, the available research linking behavior and cognition has documented a need for a study that explores a complete comparison of cognitive functioning and behavioral typology. While the specific aspects of behavior or intelligence have been researched in one form or another, with the exception of McKenna-Mattson (2005) there are virtually no published studies which have provided a more wholistic comparison of these two factors from which researchers can extrapolate foundational analyses to bring the existing research in the field of cognitive-behavioral psychology together. Furthermore, while CHC Theory is the most widely recognized construct for describing cognitive structure, there is surprisingly limited research bridging the gap between our understanding of how this theoretical model relates to behavior. Finally, while not all variables in the administration and collection of initial data can be controlled, the depth and breadth in the scope of a secondary analysis outweighs these limitations in terms of both time and available data in bringing this information to the field.

Chapter 2

Introduction

The differential diagnosis and treatment of social-emotional disorders in children has become increasingly complex as assessment tools and practices continue to evolve. Despite improvements in standardized testing instruments and increased depth in psychology's empirical understanding of behavioral reactivity in children, very little research linking or differentiating cognitive and emotional functioning has been done. As previously noted in chapter one, the majority of research linking behavioral/emotional reactivity to cognition has focused on single areas of intellectual functioning (Kunzmann & Richter, 2009), or to specific learning disorders (Filippatou, Dimitropoulou, & Sideridis, 2009) rather than a comprehensive comparison to cognitive profile typology.

A vast majority of the literature to date has reported on general intellectual ability as the most stable measure of cognitive functioning for use in comparing behavioral and emotional typologies (van Nieuwenhuijzen et al., 2009). Although other researchers have sought to compare individual composite areas of intellectual functioning in relation to behavior and emotion (Black et al., 2009), they suggested more in-depth research that explores IQ discrepancies as possible important markers in social disorders. Indeed, Greenbaum et al. (2009) substantiated the existence of deficits in social cognition, or recognizing and interpreting differences in facial emotional and behaviors, but most studies have fallen short of pursuing the exploration of differences in intellectual functioning that may be related to social

cognitive skills. Thus the current study seeks to bridge the gap toward linking cognitive differences in children already identified as having social and behavioral problems, to areas known or theorized to be related to social cognition.

Review of CHC theory and its application toward conceptualizing the role of intelligence will be addressed throughout this chapter. The constructs of its key components, research supporting its role in understanding behavior, and its utility in measuring and capturing individual differences will all be explored, and the current body of research reviewed to provide insight into the methodology and conceptual framework used to define our current understanding of intelligence and emotion cognition.

Literature Search Strategy

The review of literature for this study focused primary on research completed and published over a period spanning the past decade; however, historical studies and references essential to establishing a theoretical foundation for this study were also reviewed and cited. References included original research articles from peer-reviewed journals, books, published and unpublished dissertations, and conference presentations. An extensive list of keywords searched included: cognition, cognitive ability, intelligence, working memory, processing speed, perceptual reasoning, verbal comprehension, WISC-IV, BASC2, behavior, internalizing, externalizing, emotions, reactivity, social behavior, child behavior disorders, learning disabilities, regulation, differences, predicting, emotional intelligence, CHC theory, Carroll's three-stratum model, Horn-Cattell theory, and combinations of all the above as specifiers or limiters under the primary keywords

"intelligence" and "behavior". In areas where little research existed, primarily in regard to correlations or references to "CHC theory and behavior", publications that focused primarily on cognitive theory (i.e. Flanagan, Genshaft, & Harrison, 1997; Flanagan & Harrison, 2005) were cross-referenced for possible secondary citations and abstracts related to the current study.

Theoretical Foundation

History of/foundations of CHC theory

The Carroll-Horn-Cattell [CHC] theory on intelligence and cognitive abilities can be historically viewed as a combined theory of two separate, yet highly similar concepts of intellectual development. As originally theorized by Cattell (1941), intelligence is more than singular concept, but rather a complex aggregate of many individual, specialized cognitive abilities. He grouped these abilities broadly into what he termed fluid (Gf) and crystallized (Gc) intelligences. In his work with Cattell, John Horn (in Flanagan, 1997) expanded upon G*f*-G*c* theory to demonstrate that there are, in fact, many processes involved in cognition, and that these processes can be grouped into categories as either broad or narrow abilities. Broad abilities are those processes that are considered distinct, primary factors of intelligence, and as research has shown, are measurable on standardized IQ tests and neuropsychological instruments (Carroll, 1997; Woodcock, 1990). Narrow abilities, on the other hand, are individual processes or factors, within each broad ability, that exhibit relative similarities across these broad factors, and are thus empirically related to intelligence within Gf-Gc theory, but for which all the

covariance across broad abilities can not be statistically accounted for (Horn & Noll, in Flanagan, 1997).

In his own research on intelligence, John Carroll (1997) also defined cognitive functioning in terms of broad and narrow factors of inter-related abilities, but differed from Horn and Cattell in his conceptualization of these factors as comprised of three, increasingly specific stratum of intellectual processes identified through a factor analysis of decades of research on the identification and structure of human cognition. In contrast to Horn-Cattell's theory that cognition is a cluster of multiple intelligences, Carroll theorized that intelligence can indeed be construed as a singular entity, and that the broad and narrow abilities highlighted by Horn-Cattell are not multiple, separate functions, but rather factors within a general, integrated construct of intelligence (Carroll, 1997).

While technically separate theoretical conceptualizations, Carroll's and Horn-Cattell's models of human intelligence share the foundational Gf-Gc constructs of Cattell's original work, primarily differing only in their opinions about the organization of these factors and the existence of a presiding *g* factor, and thus have come to be viewed in combination through taxonomy as the Carroll-Horn-Cattell [CHC] theory of cognitive abilities (McGrew, 1997).

Applications of CHC theory to understanding behavior

Linking cognition and behavior has long been an area of intense interest to the field of psychology, and the clinical, social, and organizational applications of the relationship between these factors has been thoroughly researched and documented. More specifically, over the past 70 years, the field of psychology has

endeavored to establish the methods of quantitatively analyzing the structural components of intelligence, and behavior, as well as the integration of these two elements within the context of human development. To date, the majority of research linking emotional reactivity to cognition has focused on single areas of intellectual functioning (Kunzmann & Richter, 2009), or to specific diagnostic profiles or learning disorders (Filippatou, Dimitropoulou, & Sideridis, 2009) rather than a comprehensive comparison to cognitive profile typology. Furthermore, while an abundant body of research exists that compares intellectual functioning to externalizing behavior, there is a substantial void in empirical exploration into possible relationships between intelligence and internalizing factors, with the exception of a small body of research wherein only singular indicators of internalizing behaviors, such as depression (Timbremont & Braet, 2005), or a combination of depression and anxiety (Corapci, Smith, & Lozoff, 2006; Rapport et al., 2001) are compared to intellectual functioning. Dennis (2010) expertly highlights the need for more thorough assessment of internalizing problems, and noted that nearly all the research conducted to date continues to define cognition and emotion as disparate entities, rather than exploring a more integrated view of emotion and cognition.

Examining CHC theory of intelligence and how it relates to internalizing and externalizing behavior patterns.

As previously noted, most research to date has been conducted from the standpoint of establishing intelligence and behaviors, and especially internalizing factors, as disparate entities (Dennis, 2010). More specifically, very little research

has been conducted in regard to comparing CHC theory specifically to behavior. In a dissertation study aimed at addressing this need, McKenna-Mattson (2005) stipulated that research in relation to CHC factors and behavior can be described as exploratory at best because of the limited base of research from which to typify a definitive methodology. As such, the current study seeks to empirically investigate similar methodology using standardized measures of the constructs for intelligence and behavior in the forms of the Wechsler Intelligence Scale for Children – Fourth Edition [WISC-IV] and the Behavior Assessment System for Children – Second Edition [BASC-2] respectively.

How CHC theory relates to the current study

For the purposes of this study, I will be looking at broad factors of CHC theory as the current research still debates the how best to characterize narrow functions, as well as the precise stratification of narrow abilities under broader categorizations (McGrew, 2005, in Flanagan 2nd edition). While further analysis of the narrow CHC factors and how they compare to human behavior is arguably an important avenue for future study, far more research is needed to establish the correlation of broad CHC factors to behavioral patterns before stratification of any possible relationships can be achieved.

Conceptual Framework

In the field of practice-based psychology, standardized and empirically evidenced assessment of cognition and behavior has become increasingly relevant, and in many cases mandated, for identifying and treating a broad range of clinical and non-clinical disorders. Although intelligence tests, behavior rating scales, and

symptom inventories have been consistently employed in this arena for decades, the specificity and effectiveness of their use in interpretation of -- and treatment planning for -- specific clinical disorders has been largely variable, leading to a broad range of research considerations and outcomes. Borkenau et al. (2004) conducted one of the first studies to mitigate the disparity in the empirical knowledge base of standardized assessment in cognitive and social constructs by comparing rater judgments of intelligence using video-based behavioral observations rather than direct assessment of participants. Results of their study produced fairly large correlations of inter-rater reliability about observational-based judgments of intelligence [.62], suggesting a possible relationship between crystallized intellectual processes and social cognition. Their research emphasizes the possibility of trait-based social-cognitive skills and support for further exploration measurable intelligence and behavioral indicators.

In an attempt to provide focus to the body of research, Fiorello et al. (2007) examined the efficacy of using idiographic interpretation of intellectual factors in conceptualizing disabilities versus global intelligence scores. Their results indicated that shared variance in a mutli-factorial representation of intelligence is largely absent across conditions, suggesting that idiographic representation (comparing each narrow cognitive factor in each individual's profile) is far more efficacious than global interpretation. The researchers therefore advocated for utilizing specificity in interpreting individual factors of intelligence as they pertain to each condition rather than global IQ scores, which is consistent with conceptual framework in the current study.

With regard to empirical evidence linking cognitive factors to social and emotional functioning, nearly all of the literature and research to date addresses only specific indicators, or clusters of categorical components, rather than a comprehensive cognitive typology. Nevertheless, existing research provides a wealth of approaches and methodology that have substantiated the need for further study about the role cognitive abilities play in social and emotional engagement. A large section of the cognitive research in this area has substantiated a correlation between verbal comprehension and language usage abilities, particularly in regard to cognitive referencing and its role in mediating both internalizing and externalizing behavioral reactivity (Corapci, Smith, & Lozoff, 2006). In contrast, there is a body of evidence which has also shown a more significant association between behavioral reactivity and nonverbal reasoning ability (Plomin et al., 2002; Flouri & Tzavidis, 2011). To complicate matters further still, some research conducted within the past decade has reported empirical support for both of these seemingly disparate cognitive functions (Porter, Dodd, & Cairns, 2009). This disparity in establishing a concise definition about the role cognitive ability plays in the overall scope of behavioral reactivity has lead to a broader argument about whether general intelligence is a better predictor of behavioral factors, rather than individual cognitive ability composites (Buelow et al., 2003; Faul, 2006). Indeed, it has been established in the literature that overall intellectual functioning is inversely related to the existence of both internalizing and externalizing behaviors (Jaffee & Maikovich-Fong, 2011; DeYoung et al., 2008), that overall intelligence may be a good predictor of externalizing but not internalizing behaviors (Brunnekreef,

De Sonneville, & Althaus, 2007; Andersson & Sommerfelt, 2001), and that samples of individuals with higher IQ scores have shown greater moderating effects on overall behavioral reactivity (Black et al., 2009; Corapci, Smith, & Lozoff, 2006; Faul,2006).

This disparity illustrates a need for consideration for further study, and highlights an important limitation in the current body of research. As pointed out by Andersson & Sommerfelt (2001), one area overlooked in comparing and contrasting behavioral reactivity is a study that examines both overall cognitive ability as well as individual processes within the same research design. To date, nearly all of the available research has focused on only individual CHC factors or composites (Suslow, 2009; McKenna, 2006; Nas, Orobio, & Koops, 2005), and at best has controlled for full-scale intelligence as a variable rather than conducting comparisons of cognitive profiles as a whole (Black et al., 2009; Deater-Deckard et al., 2009; Brunnekreef, De Sonneville, & Althaus, 2007).

As previously mentioned, there are many empirical studies that have attempted to explore the correlation between cognitive ability and behavior, and the methodology of the research in this area has consistently used standardized cognitive assessment as a key variable in defining both the impact and predictive value of cognition in regard to behavioral reactivity. Also, given that instruments available for assessing intellectual functioning have been available for decades, but only more recently linked to CHC cognitive theory, most of the published literature has defined cognitive variables very broadly, and in terms of verbal and nonverbal ability composites. Filippatou, Dimitropoulou, & Sideridis (2009) demonstrated this trend in their research examining differences between students with a learning

disability [LD] and those with an identified speech or language impairment [SLI] in terms of social-emotional functioning. In their analysis of 137 children using the WISC-III and CBCL, they found that although cognitive differences existed between these two groups, specifically higher verbal ability scores for the LD grouping, their social-emotional profiles showed similar behavioral typology. More importantly, cognitive ability differences on verbal tasks were not a useful factor in their study for determining predictability of social and emotional functioning.

Conversely, in a more insightful and better constructed longitudinal study, Corapci, Smith, & Lozoff (2006) assessed both maternal and child intelligence over time in relation to CBCL social profiles. Their results suggested that high verbal IQ may, in fact, be related to better resilience in the face of adverse conditions during childhood. Their results raise the possibility that interventions to improve verbal competence might help lower the risk of internalizing problems in the face of early adversity, and that verbal ability plays a greater role than previously thought. Likewise, Yu at el. (2006) also demonstrated differences in social and emotional profiles of children with verbal versus nonverbal learning disabilities. In their study of 985 children, results indicated that children with verbal learning disabilities were 89% more likely to exhibit externalizing behavior problems compared to those without verbal difficulties. It was important to note that this study relied primarily on standardized academic indicators of reading or math skills to define its group variables rather than standardize measures of intelligence. Nevertheless, significant measurable differences were found between groups, lending credence to the notion in cognitive literature that verbal ability may play an important part in behavioral

reactivity, and furthermore, that more research in this area is needed to explore why these differences are exhibited.

Summary and Conclusions

Although theoretical conceptualizations of human cognition and is relationship to human behavior have existed for decades (Cattell, 1941; Carroll, 1997), empirical exploration and validation of relational or predictive links between those constructs and behavior has only more recently become a serious area of research in the field of cognitive psychology (Buelow et al., 2003; Borkenau et al., 2004; Faul, 2006). Furthermore, despite the fact that research in this area continues to grow, the majority of research linking emotional reactivity to cognition has focused on single areas of intellectual functioning (Kunzmann & Richter, 2009), or to specific diagnostic profiles or learning disorders (Filippatou, Dimitropoulou, & Sideridis, 2009) rather than a comprehensive comparison to cognitive profile typology, and nearly all the research conducted to date continues to define cognition and emotion as disparate entities, rather than exploring a more integrated view of emotion and cognition instead (Dennis,2010).

This purpose of this study is not only to add to the body of knowledge on the relationship between cognition and behavior, but more specifically to fill the gap in the available research base in two ways: (1) to provide a comprehensive comparison of cognitive factors and behavior that until now has been done on predominantly on a factor-specific basis, and (2) provide factor-specific analyses of possible cognitive and behavioral relationships within the same study. While most studies reviewed have attempted to explore cognitive-behavioral relationships, no

other study found to date has compared complete profiles and factor-specific analyses within the same research design. The methodology of the current study will capitalize on this need, using an existing dataset, two widely used and empirically validated instruments (WISC-IV & BASC2), and a comprehensive analysis of both complete cognitive profiles and factor-specific comparisons.

Chapter 3

Introduction

The current study borrows similar methodology from McKenna-Mattson (2005) by comparing factors of intellectual functioning and behavioral profiles via secondary data analysis. Specifically, this methodology will provide for more efficient access to a larger compilation of data than would be feasible to amass through first-hand collection for the purposes of this study. As noted previously, there is a problem in the differential diagnosis and treatment of social-emotional disorders in children. Despite improvements in standardized report measures that attempt to differentiate internalizing versus externalizing emotional reactivity in children, little has been done in the way of delineating these two very different types of emotional reactivity in relation to cognition. In fact, the majority of research linking emotional reactivity to cognition has focused on single areas of intellectual functioning (Kunzmann & Richter, 2009), or to specific learning disorders (Filippatou, Dimitropoulou, & Sideridis, 2009) rather than a comprehensive comparison to cognitive profile typology. Subsequently, as the focus of this dissertation is to seek statistical evidence for the relationship between behavior and a comprehensive cognitive theory, being able to gather a significant quantity of these profiles provides the opportunity to explore whether relationships between cognitive profiles and behavioral typologies can be empirically demonstrated. The implications for this study relate to identifying differences, strengths, and limitations of current social and emotional programs and therapies utilized for these

two populations, and seeks to develop understanding of cognitive differences between these groups can lead to better cognitive-behavioral interventions.

Although arguably limited in the ability to control for certain variables accounted for in a more direct research design, the use of secondary analysis was chosen for two reasons. First, use of an existing dataset significantly reduces the time and clinician hours needed to compile a sufficient participant data pool that would meet the design of the current study. Secondly, from an ethical standpoint, given that the population for this study is comprised of school-age children, use of a secondary analysis takes advantage of existing information in lieu of subjecting a large subset of children to hours of testing solely for the purpose of research. In addition, although generalization of results to the broader population may be limited given that this data was accumulated by a single local school district, the overall study population has a high probability of being demographically representative of the local area, which will allow for generalization of results directly toward treatment program differentiation.

Research Design and Rationale

The research design for the current study was adapted from that of a similar study by McKenna-Mattson (2005). This proposed design for this study is a non-experimental, secondary data analysis of an existing dataset contained at a local school district, with a focus on comparing differences in cognitive ability profiles between two groups of children who have internalizing versus externalizing behavioral profiles. Virtually no research can be found in contemporary literature that has examined comprehensive profiles. Most of the research that exists has

focused on only one or two aspects of either internalizing or externalizing behaviors (Hinshaw 2002), or specific areas of cognition only (Benner et al., 2008). Conducting a comprehensive comparison of both cognitive and behavioral profiles will address the question of whether there are significant differences between the cognitive profiles of students with internalizing versus externalizing social-emotional behavioral patterns.

Subsequently, further analysis of any differences that exist is needed to answer the following questions: 1) Are differences between groups directly and significantly correlated with the variables being studied versus individual differences and chance? 2) Are there significant differences between WISC-IV broad (FSIQ) and narrow factors of CHC cognitive functioning (VCI, PRI, WMI, & PSI) between groups? and 3) Can differentiation of the variable groups using verbal versus nonverbal abilities be supported as noted in the literature (Fiorello et al., 2007; Black et al., 2009)?

Due to the limited scope of available studies and variability of evaluation instruments used, effects sizes in the studies I have reviewed range considerably from as low as .20 (Brunnekreef et al., 2007), to as high as 1.53 (Knivsberg & Andreassen, 2008). Other studies which have included multiple areas of behavior and/or cognition, fall more in the median ranges of .41 (Heller et al., 1996), .56 (Bub, McCartney, & Willett, 2007) and .67 (Black et al., 2009). These studies were the ones chosen to estimate effect size for the current study.

Statistical power was set at .80, and alpha at .05 to ensure appropriate effect size, as is standard for most psychological and behavioral science research (Cohen,

1988, Asraf & Brewer, 2004). Estimated effect size was determined using the average of three studies whose methods most closely resembled the current study: .41, .56, and .67, with the average affect size being .55. Based upon this estimate of effect size, sample size was determined using both the estimation tables provided and the SOCR online statistical calculator from UCLA. Sample size was determined to be n=64 for each of the two groups for this study (Total n=128).

Methodology

Population and Sampling

The population for this study will be taken from review of special education files from a local school district in Southeast Alaska. The population for this study included 128 male and female children in South East Alaska between the ages of 6-16, and from various ethnic backgrounds, who have previously been administered both the BASC 2 and WISC-IV within the past 6 years by licensed or certified psychologists in accordance with the requirements of school districts daily services under the Individuals with Disabilities in Education Act [IDEA]. Population sampling will be gathered from an existing psychology database of students whose parents and teachers are known to have been administered the BASC-2. Access to the database has been made available for the purpose of this study through a Data Use Agreement with a local school district. Use of a database, will eliminate the need for direct contact with students, and allow for a feasible way in which to amass the large amount of data needed for this study. From this group, a population of students who were also known to have been administered the WISC-IV will be

compiled. Finally, the cases within this specific population sample will be reviewed and selected for either the internalizing or externalizing independent variable, and a random sampling will be conducted to select the 64 cases for each independent variable grouping.

Research data sought to be collected include WISC-IV profile and index scores, BASC-2 multi-rater profile and index scores, and information on gender, ethnicity, and age range of students in the dataset. This data will be primarily analyzed for profile differences between the internalizing and externalizing groups. In addition, secondary analyses of WISC-IV subset composites among the dependent variables will also be conducted to determine whether significant intra-cognitive differences exist. Cases missing information or not given the WISC-IV will be removed from the pre-selection population during the file review process.

Archival Data Procedure

No personally identifiable information will need to be collected for the purposes of this study, although a temporary list of individuals for whom information was collected will need to be kept in order to control for accidental duplication and analysis of collected results. A letter of cooperation and data-usage agreement to gather a limited data set [LDS] will be obtained prior to submission of this proposal to the Walden University IRB. Names on this list will be coded by unique number assigned by the researcher, rather than name or identity, in order to preserve confidentiality. This code sheet will be kept in a password-protected spreadsheet known only to the researcher, and will be destroyed upon completion of the study. Raw data gathered from the LDS will be archived in a spreadsheet

format through SPSS statistical software for future analysis, and raw data kept on a secure and encrypted removable computer drive in a secure location for the minimum 5 years required.

Data Included in the Sample

Data gathered for this study will constitute a LDS in which no personally identifiable data will be reported. Age, grade, gender, and ethnicity, as well as WISC-IV composite standard scores and BASC-2 composite scores will be contained within the LDS. Files missing information or that do not have complete intelligence testing composites will be excluded from the study. Given that specific dates of WISC-IV administrations for each case can not be ascertained prior to data collection, a timeline of 6 years will be used to limit the scope of data collection and sampling, which is in alignment with the triennial evaluation timeline and requirements for school districts established through federal special education legislation (IDEA). Only the most recent WISC-IV and BASC2 profiles will be used for the purpose of this study.

Instrumentation (WISC-IV, BASC2)

The *Wechsler Intelligence Scale for Children – 4th Edition [WISC-IV]* is an instrument designed to measure intelligence in children aged 6 years through 16 years of age. Its framework includes 10 main subtests and 5 additional subtests that yield a broad composite intelligence quotient score [FSIQ], and four indices of narrower cognitive functioning (Wechsler, 2003). Normative and test validation procedures for the WISC-IV were reported to meet the *Standards for Educational and Psychological Testing* as established by the American Psychological Association (APA, 1985). Reliability coefficients for the subtests range from .79 to .90

(acceptable), while the reliability coefficients for the composite scores are higher (.88 to.97). A large body of research exists for both the WISC-IV and it's previous versions that substantiate its content, criterion-related, and construct validity.

The *Behavior Assessment System for Children – 2nd Edition [BASC-2]* is a multi- method tool used to evaluate the behavior of children and adolescents 2 to 25 years of age, and incorporates parent (PRS), teacher (TRS), and self-report (SRP) forms to provide a multi-dimensional assessment of behavioral and emotional disturbances (Reynolds & Kamphaus, 2004). The BASC-2 scales and composites are consistent across both the TRS and PRS forms, allowing for direct comparison of behaviors across settings. Both forms provide scores in four broad domains (Internalizing Problems, Externalizing Problems, School Problems, and Adaptive Skills), and one broad composite (Behavioral Symptoms Index), of which only the Internalizing and Externalizing composites will be used for this study. As this instrument is a report form and not a direct assessment of ability, reliability of the BASC2 is based upon factors of internal consistency and interrater reliability. Internal consistency for both the BASC2 TRS and PRS Externalizing and Internalizing Composites ranged from .85 to .97, and .85 to .92, respectively. Interrater reliability varied across forms, with somewhat higher consistency on the PRS for both Externalizing Problems (.66 to .78) and Internalizing Problems (.65 to .70), than was reported for the TRS (.61 to .71 and .48 to .61, respectively). For consistency, and to mitigate some of the variability between raters, the average rating for Externalizing Problems and Internalizing Problems composites from the Multi-rater Comparison profile will be used.

Operationalization for each variable

Behavioral reactivity has been defined in terms of the average rater score for children who exhibit primarily internalizing behavior versus externalizing behavior as measured by the Behavior Assessment System for Children, Second Edition [BASC2]. The BASC2 is based on a standardized average T-score of 50 and standard deviation of 10 points. The externalizing behavior group (IV 1) will be defined as those individuals whose BASC2 average rating for overall externalizing behavior is at least one standard deviation above the mean (T>60), and at least one standard deviation higher than their internalizing profile (10 points). Conversely, the internalizing group (IV 2) will be defined as those individuals whose BASC2 average rating for overall internalizing behavior is at least one standard deviation above the mean (T>60).

Data Analysis Plan and Planned Statistical Analyses

Data will be analyzed for profile differences across the WISC-IV using the average BASC2 ratings of the previously defined two independent variables of internalizing versus externalizing behavioral reactivity. The specific hypothesis are: (1) There will be significantly higher VCI scores on the WISC-IV for individuals in the Internalizing group compared to the Externalizing group, (2) There will be significantly higher PRI scores on the WISC-IV for the Externalizing group compared to the Internalizing group, (3) The internalizing group will have higher WMI scores than the Externalizing group, and finally (4) PSI will be higher in the Externalizing group compared to the Internalizing group.

To answer the research questions of this study, a series of 4 Independent Samples *t* tests will be used to determine whether differences exist between independent variables across the four broad intellectual domains of VCI, PRI, WMI, and PSI as measured by the WISC-IV.

Threats to Validity

Given that the data collected in this study will be of a second-hand nature, it will have to be assumed that the standardized measures in this study were administered and scored by appropriately trained and certified examiners.

Ethical Procedures

Protecting the identity and confidentiality of the children whose information will be used in this study is of primary necessity. No personally identifiable information will need to be collected for the purposes of this study, although a temporary list of individuals for whom information was collected will need to be kept in order to control for accidental duplication and analysis of collected results. This list will be coded by unique number, rather than name or identity, in order to preserve confidentiality, and this code sheet will be kept by another school psychologist and destroyed upon completion of the study.

As with any study that involves gathering information from a secondary source, formal written letter of cooperation will be requested from the school district, as well as a signed Data Use Agreement prior to submission to the Walden University IRB. As the data in this study represents a limited data set [LDS] in which no personally identifiable information is to be permanently recorded or reported in the study, no parental consent is required (See FERPA, 35 CFR Section 99.3).

Summary

Overall, the methodology of this study represents an attempt to expand upon the body of knowledge and methods previously initiated by McKenna-Mattson (2005) in her research on linking factors of behavior and intelligence toward an integrated understanding of both. As pointed out by Kunzmann & Richter (2009), the scope of research in this area to date has been limited to specific cognitive processes, and the authors suggested future research should look at comprehensive cognitive picture, including the mechanics of cognition in relation to behavior and emotion. In addition, use of a secondary analysis reduces and, in most cases, eliminates any risk to the sample population of focus. It is surmised that utilizing data that was gathered with the intent to inform real-life decisions will also increase the generalizability of results, and that the time saved by accessing an existing dataset can be better spent conducting factorial analyses of the variables, lending empirical support this study, while leading to more in-depth knowledge and future research into the possible relationships between cognitive and behavioral factors.

Chapter 4

Introduction

The purpose of this quantitative study is to examine cognitive profile differences on the Wechsler Intelligence Test for Children, Fourth Edition [WISC-IV] (Wechsler, 2003) for children with internalizing versus externalizing profiles of emotional reactivity. Behavioral reactivity has been defined in terms of the average rater score for children who exhibit primarily internalizing behavior versus externalizing behavior as measured by the Behavior Assessment System for Children, Second Edition [BASC2] (Reynolds & Kamphaus, 2004). Children who exhibit internalizing social-emotional disorders often receive different, and in many cases more extensive, interventions and services than those with externalizing behavioral difficulties or disorders. The implications for this study relate to identifying cognitive differences, strengths, and limitations of these two groups and how they may relate to current social and emotional programs and therapies utilized for these two populations. Specifically, this study seeks to develop understanding of cognitive differences between these groups that could potentially lead to better cognitive-behavioral interventions. For instance, as Kunzmann & Richter (2009) demonstrated in their study on emotional reactivity [ER], high verbal cognitive processes appeared to play an important role in mitigating ER. This may suggest that high versus low verbal cognitive skill level should be taken into account when deciding on an effective therapeutic strategy (i.e. play versus talk therapy, group versus individual therapy). For example, someone with higher verbal skills may likely be

able to engage in an in-depth psychoanalytic therapeutic discussion to gain insight on their emotionality, whereas someone with lower verbal skills may not, and might be better served through a behavioral or cognitive-behavioral workbook.

This section provides details on the data collection procedures, as well as a descriptive breakdown of the sample demographics of age, gender, and grade level of cases in the LDS (Tables 1 & 2). Mean group statistics (Table 3) and results of *t* test analysis for the four broad areas of cognitive processing in relation to the research questions (Table 4) are also provided. Brief clarification of the results for each research question is explored, with further discussion about findings and their implications will be discussed in greater detail in Chapter 5.

The research questions for this study reflect an attempt to understand cognitive differences in relation to behavioral reactivity, and explore: 1) Whether verbal processes on the WISC-IV show greater variability in children with internalizing than externalizing behaviors, 2) Whether the nonverbal processes on the WISC-IV show greater variability in externalizing than internalizing behavioral profiles, and 3) Does the nature of executive or automatic processes, such as working memory and processing speed differ between groups?

The specific hypothesis are: (1) There will be significantly higher VCI scores on the WISC-IV for individuals in the Internalizing group compared to the Externalizing group, (2) There will be significantly higher PRI scores on the WISC-IV for the Externalizing group compared to the Internalizing group, (3) The internalizing group will have higher WMI scores than the Externalizing group, and

finally (4) PSI will be higher in the Externalizing group compared to the Internalizing group.

Data Collection

The population for this study was taken from a LDS including information from special education files from a local school district in Southeast Alaska, for which a Data Use Agreement was obtained. No discrepancies or difficulties in data collection were reported. The population for this study was taken from a larger LDS (n=217) provided by the school district on December 22, 2014, from which any personal identifying information was removed. No deviation from the planned data collection referenced in Chapter 3 were needed. Cases missing variable scores (n=53) were not included in the sampling. The sample taken from this LDS included 128 male and female children in South East Alaska between the ages of 6-16, and from various ethnic backgrounds, who have previously been administered both the BASC 2 and WISC-IV within the past 6 years by licensed or certified psychologists in accordance with the requirements of school districts daily services under the Individuals with Disabilities in Education Act [IDEA]. Cases were sorted by descending Internalizing scores on the BASC 2, with the first n=64 placed into the Internalizing group. The remaining cases were sorted in a similar fashion by Externalizing score on the BASC 2. The first n=64 cases that met methodological requirements of at least a 10-point elevation in externalizing over internalizing BASC 2 scores were assigned to the Externalizing group. The remaining cases (n=36) that did not meet the criteria or were beyond the first 64 cases were not included in the study.

Demographic information provided on the school district website indicated a nearly 1:1 gender of male students (52%) to female students (48%). Demographic information from the LDS sample also reflected a higher occurrence of male students (68%) to female students (32%), although the ratio for the sample (2:1) was higher than the district-reported demographic information. Table 1 provides the gender frequencies of male (N=87) versus female (N=41) students in the population sample, suggesting a higher representation of male students in the current sample than exists in the general population. Table 2 provides the baseline descriptive and demographic characteristics of the sample in the LDS. The spread of Age and Grade Levels represented in the sample spanned nearly the entire public education spectrum (i.e. K-12), although the nature of the normative structure of WISC-IV (ages 6-16) meant that students at extreme ends of the spectrum in either kindergarten or 12th grade would not be represented in either the sample or the general population of students administered this instrument. Table 2 also reports that the mean age of students in the sample was 9.5 years, and the mean grade level of 3.9

Table 1
Gender Demographics in Sample

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	87	68.0	68.0	68.0
Female	41	32.0	32.0	100.0
Total	128	100.0	100.0	

Table 2
Descriptive Statistics

	N	Minimum	Maximum	Mean
AGE	128	6.0	16.0	9.508
GRADE	128	1.0	11.0	3.969
BASC2Ext	128	44	92	68.88
BASC2Int	128	42	95	63.89
FSIQ	128	61	119	92.61
VCI	128	65	132	95.19
PRI	128	61	132	99.27
WMI	128	59	113	90.05
PS	128	53	118	88.73

Results

Four independent samples *t* tests were conducted to examine the research hypotheses that: (H1) There will be significantly higher VCI scores on the WISC-IV for individuals in the Internalizing group, (H2) There will be significantly higher PRI scores on the WISC-IV for the Externalizing group, and (H3) The internalizing group will have higher WMI scores, and (H4) PSI will be higher in the Externalizing group. Table 3 provides the mean group statistics in the 4 broad areas of cognitive functioning examined in this study (VCI, PRI, WMI, PSI). Table 4 provides the results of the *t* test analyses.

Table 3
Group Statistics

	IV	N	Mean	Std. Deviation	Std. Error Mean
VCI	Internalizing	64	98.41	12.237	1.530
	Externalizing	64	91.97	11.528	1.441
PRI	Internalizing	64	101.17	13.422	1.678
	Externalizing	64	97.38	12.217	1.527
WMI	Internalizing	64	91.48	10.801	1.350
	Externalizing	64	88.63	11.046	1.381
PS	Internalizing	64	88.58	14.810	1.851
	Externalizing	64	88.88	12.746	1.593

Table 4
Independent Samples Test

	Levene's Test for Equality of Variances		*t test* for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
VCI	.000	.984	3.063	126	.003*	6.438	2.101	2.279	10.596
PRI	.416	.520	1.674	126	.097	3.797	2.269	-.693	8.287
WMI	.343	.559	1.481	126	.141	2.859	1.931	-.962	6.681
PSI	.825	.365	-.122	126	.903	-.297	2.442	-5.130	4.537

Research Question #1

Do verbal processes on the WISC-IV show greater variability in children with internalizing than externalizing behaviors? To answer this question, an independent samples *t* test was conducted to test the hypothesis that VCI scores on the WISC-IV will be significantly higher for individuals in the Internalizing group.

As predicted, results indicated that students in the internalizing behavior group (M=98.41, SD=12.237, N=64) exhibited significantly higher scores in the area of VCI (t =3.063, $p < .05$, two-tailed) than students in the externalizing group (M=91.97, SD=11.528, N=64). In this case, the null hypothesis was rejected. VCI was indeed significantly higher for the Internalizing group as expected. A moderate effect size for this finding was also noted (Cohen's d = .54). Results are also provided in Tables 3 & 4.

Research Question #2

Do the nonverbal processes on the WISC-IV show greater variability in externalizing than internalizing behavioral profiles? To answer this question, an independent samples *t* test was conducted to test the hypothesis that there will be significantly higher PRI scores on the WISC-IV for the Externalizing group.

Contrary to the prediction, results indicated that students in the externalizing behavior group (M=97.38, SD=12.217, N=64) did not exhibit significantly higher scores in the area of PRI (t =1.674, $p > .05$, two-tailed) than students in the internalizing group (M=101.17, SD=13.422, N=64). No significant

differences were noted between the two groups in terms of broad nonverbal cognitive processes. Results are also provided in Tables 3 & 4.

Research Question #3

Does the nature of CHC executive or automatic processes, such as working memory and processing speed differ between groups? To answer this question, independent samples *t* tests were conducted to test the hypotheses that: (H3) The internalizing group will have higher WMI scores, and (H4) PSI will be higher in the Externalizing group.

In regard to the hypothesis that differences exist in the area of WMI (H3a), results indicated that students in the internalizing behavior group (M=91.48, SD=10.801, N=64) did not exhibit significantly higher scores in the area of WMI (t =1.481, $p > .05$, two-tailed) than students in the externalizing group (M=88.63, SD=11.046, N=64). While significant differences in general verbal cognitive processes were expected and supported in question #1, no significant differences were found in terms of the verbal executive process of WMI between groups. Results are also provided in Tables 3 & 4.

In regard to the hypothesis that differences exist in the area of PSI (H3b), results indicated that students in the internalizing behavior group (M=88.58, SD=14.8010, N=64) did not exhibit significantly higher scores in the area of PSI (t = -.122, $p > .05$, two-tailed) than students in the externalizing group (M=88.88, SD=12.746, N=64). Although the original study by McKenna-Mattson (2005) demonstrated some significant correlations between processing speed (Gs) and emotional reactivity and reported behavioral outcomes, results of this study

indicated no significant differences in terms of Gs between groups. Results are also provided in Tables 3 & 4.

Summary

Paired samples *t* test comparative analyses were used to determine whether the broad cognitive factors on the WISC-IV differed between groups of students with internalizing versus externalizing patterns of behavioral reactivity as measured by the BASC2. An analysis was completed for each of the four broad WISC-IV composite areas of VCI, PRI, WMI, and PSI.

Using comparisons with an alpha level of .05, VCI (t =3.063, $p < .05$, two-tailed) was noted to be significantly higher in students with internalizing profiles on the BASC2 (M=98.41), than in students in the externalizing group (M=91.97). In contrast, results of *t* test results for PRI, WMI, and PSI did not demonstrate any significant differences in terms of comparisons to behavioral reactivity.

Overall, the findings of this study reflect those available in the current literature, and specifically support the findings of McKenna-Mattson (2005) in terms of verbal cognitive processes and behavioral reactivity. Interpretation of results and generalizability of the current findings in relation to current literature, as well as the limitations and implications for social change will be further explored in Chapter 5.

CHAPTER 5

Introduction

Linking cognition and behavior has long been an area of intense interest to the field of psychology, and the clinical, social, and organizational applications of the relationship between these factors have been thoroughly researched and documented. More specifically, over the past 70 years, the field of psychology has endeavored to establish the methods of quantitatively analyzing the structural components of intelligence, and behavior, as well as the integration of these two elements within the context of human development. To date, the majority of research linking emotional reactivity to cognition has focused on single areas of intellectual functioning (Kunzmann & Richter, 2009), or to specific diagnostic profiles or learning disorders (Filippatou, Dimitropoulou, & Sideridis, 2009) rather than a comprehensive comparison to cognitive profile typology, and nearly all the research conducted to date continues to define cognition and emotion as disparate entities, rather than exploring a more integrated view of emotion and cognition instead (Dennis,2010).

The purpose of this study was to examine several of the broad factors of Cattell-Horn-Carroll CHC theory as measured by the Wechsler Intelligence Scale for Children – 4th edition [WISC-IV] and whether differences exist between internalizing versus externalizing profiles on the Behavior Assessment Scale for Children – 2nd Edition [BASC2] in children between 6-16 years of age. Based on similar methodology from McKenna-Mattson (2005), it is important to clarify the difference between the broader term “cognition” used in that study, which refers to the

integration of a complex series of biological and learned mental processes used to analyze and synthesize cognitive events, and the more specific, structural components of human reasoning and problem-solving defined as "intelligence" which is the focus of the current study**.**

This proposed design for this study constituted a non-experimental, secondary data analysis of an existing dataset. Data was matched to one of two groups of students who exhibited primarily internalizing patterns versus externalizing patterns on the Behavior Assessment Scale for Children, Second Edition [BASC2], who have also been administered the Wechsler Intelligence Scale for Children, Fourth Edition. WISC-IV composite and index scores were compared between the BASC2 groups to determine if significant differences exist between the profiles for these two groups in relation to cognitive reasoning and processes. Current research (Dennis, 2010) suggested that cognition and behavior are far more integrated that previously theorized. A study that compares these two categories of behavioral reactivity as measured by the BASC 2 to a comprehensive cognitive profile such as the WISC-IV will help in clarifying whether significant profile differences exist that may assist mental health practitioners in developing more effective interventions for these two groups.

Findings

The research questions for this study reflect an attempt to understand cognitive differences in relation to behavioral reactivity, and explored: 1) Whether verbal comprehension (VCI) on the WISC-IV show greater variability in children

with internalizing than externalizing behaviors, 2) Whether the nonverbal processes (PRI) on the WISC-IV show greater variability in externalizing than internalizing behavioral profiles, and 3) Does the nature of executive or automatic processes, such as working memory and processing speed differ between groups? Results of the study indicated that the null hypothesis could only be rejected for Question #1. No significant results were obtained for subsequent hypotheses, and therefore conclusions and discussion can only be drawn in relation to Question #1.

Verbal Comprehension and Behavioral Reactivity

In terms of verbal comprehension, the results of the study concluded that significant differences do in fact exist between children with internalizing versus externalizing behavioral profiles. More specifically, in keeping with current research (Black et al., 2009; Filippatou, Dimitropoulou, & Sideridis, 2009; Porter ,Dodd, & Cairn, 2009; McKenna-Mattson, 2005), results of this study demonstrated that children with high levels of internalizing behaviors demonstrated higher scores on the WISC-IV Verbal Comprehension Index than students with high externalizing behavioral profiles. These results appear to indeed implicate verbal comprehension abilities as a significant factor in differentiating behavioral reactivity typologies. While the methodology and data sample of the current study does not allow for correlational analyses, comparison with the results of studies like Yu et al. (2006) and Corpaci, Smith, & Lozoff (2006) suggest the results of this study do support the body of research implicating verbal cognitive ability as a possible moderating or differentiating factor in internalizing behavioral reactivity. This is important as it suggests that verbal comprehension ability may be a moderating or contributing

factor in the presence of internalizing or externalizing behavior, although more research with a larger sample size a greater demographic representation is needed to investigate any potential relationship.

Disparity in the literature and limited correlational research studies, including this study, in regard to verbal comprehension and behavioral reactivity make it difficult to draw any definitive conclusions, but the significant findings suggest a potential link between crystallized intellectual processes [i.e. VCI] and the existence of CHC trait-based social-cognitive skills. In other words, it is possible that verbal comprehension cognitive skills are a necessary, innate intellectual factor in mitigating the existence of externalizing behavioral reactivity or, conversely, a contributing factor in the formulation of internalizing behaviors. If so, then VCI needs to be taken into account when analyzing an individual's social-emotional structure to help determined whether observable traits are learned behaviors, emotional reactions, and the ability of the client to engage in various therapeutic practices or systems.

On a side note, although Suslow (2009) found that automatic verbal processes such as working memory may function as a moderating factor between internalizing and externalizing behaviors, results of the current study found that although the WMI scores for the internalizing group were slightly higher (See Table 3), no statistically significant difference between the groups was noted. Differences in the sample size and age of participants between the studies may possibly account for this.

Perceptual Reasoning and behavioral reactivity

In terms of non-verbal processes, the results of the study concluded that no significant differences existed between groups of children with internalizing and externalizing behavioral profiles. Research in this area varied widely (Dennis, 2010), and although several studies demonstrated that high verbal IQ, often paired with lower nonverbal IQ, correlated with increase social-behavioral difficulties (Black et al., 2009; Porter, Dodd, Cairn, 2009), other researchers found that higher nonverbal intelligence was related to increases in externalizing behaviors (Flouri & Tzavidis, 2011, Plomin et al., 2002). Although scores on the WISC-IV PRI index were marginally higher for the internalizing group in the current study (See Table 3), results did not demonstrate any measureable difference between the groups.

Executive processes and behavioral reactivity

Results of the current study concluded that there were no significant differences between the internalizing and externalizing groups in terms of either WMI or PSI index scores on the WISC-IV. Several studies available in the current literature attempted to explore links between executive cognitive processes and internalizing versus externalizing behaviors (McConaughy et al., 2009; Knivsberg & Andreassen, 2008; McKenna-Mattson, 2005; Hinshaw, 2002), and illustrated higher working memory scores in children with internalizing behaviors, with lower processing speed scores for all participants that displayed elevated levels of social or emotional dysfunction. While the current study demonstrated similar cognitive profiles (See Table 3), neither WMI or PSI were reported to be significantly different between the groups.

Implications For Change In Social Practice

Given the methodological structure of the current study, and the non-correlational nature of data analyses required, it is not possible to draw any specific conclusions as to the relationship between VCI and behavioral reactivity beyond the fact that statistically significant differences between the two typologies exist. However, as verbal cognitive processes represent a distinct CHC construct and have previously been linked to internalizing behavior (Joorman, Jutta, & Gotlib, 2008), the results here are important.

Specifically, comparison to the previously mentioned studies, the lack of any other significant differences among the CHC constructs identified in this study, and moderately high effect size points toward implicating VCI as a possible differentiating factor in the identification of treatment approaches utilized in for each of the two types of behavioral reactivity. While results here are not themselves diagnostic, they strongly compare to studies such as Filippatou, Dimitropoulou, & Sideridis (2009) and Corapci, Smith, & Lozoff (2006) which have linked verbal cognitive abilities to cognitive referencing of emotional state (self-awareness), rumination on negative thoughts, and other-referent comparisons (generalization). This suggests that verbal cognitive skills might be taken into account when choosing treatment approaches. In other words, significant findings in this study support the body of research in suggesting that individuals with higher VCI may be more likely to engage in and generalize traditional psychoeducational/psychodynamic therapy approaches, with individuals exhibiting lower VCI possibly benefiting from more behavioral therapy tactics.

As previously mentioned, while results of the current study support the body of research implicating verbal cognition in behavioral reactivity, it is difficult to effectively generalize these results beyond the specific population due to the limitations of the sample size available, uniqueness of the geographical location, and nearly non-existent nature of studies of this type (See McKenna-Mattson, 2005).

Limitations of the Study

Given the nature of this study as a secondary data analysis, it is assumed that all tests were administered and scored by individuals adequately trained and qualified to perform those duties. It is also assumed that the individuals who completed the child behavior rating scales (BASC2) were provided sufficient instruction in how to fill the forms out correctly. The scope of this study was limited to the comparison of the WISC-IV and BASC2 scores available through a local school district in Southeast Alaska.

While representative of the region, the generalizability of any results of this study may be limited to this geographical and cultural locale due to the fact that this area is not necessarily representative of many of the areas in which the instruments compared in this study are employed or available for use. Furthermore, the higher post-sampling ratio of male to female students [2:1] that occurred in this study than is reported to occur in the school district as a whole means that the ability to generalize the results to the local population as a whole is also limited. Further exploration of the demographics of special populations within the district, particularly in the population of students with behavioral and emotional disabilities, would likely provide useful information to substantiate the generalizability of the

current results, but constraints on confidentiality and access to the sensitive nature of the data in this sub-population in question make this unfeasible to obtain.

Recommendations

Need for a study of this scope has been well documented in the research literature. While both internalizing and externalizing behavioral reactivity, as well as cognitive ability in relation to this arena has been examined to various degrees, most if not all the available literature has taken into account only specific aspects of behavior or intelligence (Joorman & Gotlib, 2008; Greenbaum et al., 2009), or generalized views of both (van Nieuwenhuijzen et al., 2009). The current study took a first step in the direction of comparing both broad and narrow factors of cognition and behavioral reactivity within a single design. Further studies should emphasize the need for further exploration of cross-examining intelligence and behavioral indicators, to look at cognitive index scores rather than global intellectual functioning as a means of comparing internalizing versus externalizing behavioral profiles, and explore these discrepancies as possible important markers in social-behavioral disorders.

The available research linking behavior and cognition has documented a need for a study that explores a complete comparison of cognitive functioning and behavioral typology. While the specific aspects of behavior or intelligence have been researched in one form or another, with the exception of McKenna-Mattson (2005) and the current study, there is virtually no published research to provide a more wholistic comparison of these two factors from which researchers can extrapolate

foundational analyses to bring the existing research in the field of cognitive-behavioral psychology together.

Conclusion

While CHC Theory is the most widely recognized construct for describing cognitive structure, there is surprisingly limited research bridging the gap between our understanding of how this theoretical model relates to behavior. The significant findings of differences in VCI between groups of children with internalizing and externalizing behavioral reactivity in the current study only lend credence to the notion that measurable, factorial differences exist between those groups and should be further explored through correlational and possibly meta-analytical methodologies as well. The hope is that these implications for verbal cognition in this current study will prompt other researchers to explore this specific area of cognition, leading to more in-depth knowledge and future research into the possible relationships between verbal cognitive functions and behavioral factors. The goal of this study was to move the field toward better identification and differentiation of psychotherapeutic interventions. By taking the time to further evaluate clients and their verbal cognitive structure, I believe that we can gain a better understanding of how to engage them in practices that will lead to the highest possible, lasting success for those individuals struggling to overcome emotional and behavioral challenges.

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