

Pervasive Developmental Disorders: A Golden Section Study

A THESIS

SUBMITTED TO THE DEPARTMENT OF PSYCHOLOGY
OF THE STATE UNIVERSITY OF NEW YORK AT NEW PALTZ
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE IN MENTAL HEALTH COUNSELING

By

Mitzie L. Davison

December 2008

Notice: Signature Page Not Included

This thesis has been signed and approved by the appropriate parties.

The signature page has been removed from this digital version for privacy reasons.

The signature page is maintained as part of the official version of the thesis in print that is kept in Special Collections of Sojourner Truth Library at SUNY New Paltz.

ACKNOWLEDGEMENTS

I would like to express my gratitude and appreciation to my advisors, teachers, colleagues, family and friends. This paper would not have been possible without the support and guidance from my thesis advisor, Dr. Jonathan Raskin. His patience and encouragement gave me faith in a long and tedious process. My thesis committee, Dr. Douglas Maynard and Dr. Melanie Hill, have provided me with feedback and assistance that have contributed to the improvement of this paper. This paper would not have succeeded without their help.

My thesis research is original and not only did it provide me the opportunity to grow as a student, it allowed me to grow as a young woman in my profession. I could not have successfully collaborated with two institutions without the guidance and acceptance of my supervisor. I would like to acknowledge Mary Doyle and the Adult Services program at Anderson Center for Autism for their support and contribution. Without Mary's assistance and belief in my capabilities as a professional, this paper would not have been possible. Mary's advocacy allowed me the privilege and rare opportunity to develop a research project that included people diagnosed with a pervasive developmental disability. I hope that this paper contributes to the betterment of their lives.

Lastly I would like to thank my partner Ed Kelly, my family, and my friends. Ed has patiently and lovingly supported my decisions. He has worked with me to become a more thoughtful writer. At my weakest points over the past four years of the graduate program he is the person I could count on for reassurance and motivation. Thank you to my family and friends, as they have always been there for me. They have inspired me to be a strong, independent, creative individual who can accomplish anything in life with a vision and hard work. They are a part of this thesis and I could not have done it without them.

TABLE OF CONTENTS

I.	Acknowledgements.....	iii
II.	Abstract.....	v
III.	Introduction.....	1
	Pervasive Developmental Disorders and Autism.....	2
	Theory of Mind.....	4
	Weak Central Coherence Theory.....	8
	Neurological Implications.....	9
	Golden Section Studies.....	12
	Hypotheses.....	17
IV.	Method.....	18
	Participants with Pervasive Developmental Disabilities.....	18
	Participants without a Pervasive Developmental Disability.....	19
	Materials.....	20
	Procedures.....	21
V.	Results.....	25
VI.	Discussion.....	27
	PDD and Non- PDD participants use of the Golden Section Ratio.....	27
	Self Ratings.....	27
	General Thoughts and Possibilities.....	28
	The Issue of Power.....	29
	Future Research.....	30
VII.	Tables	32
VIII.	References.....	34

ABSTRACT

Objectives. Pervasive developmental disability theories are combined with golden section research in an effort to understand how people organize and process interpersonal/social information. In order to comprehend theories that explain the social impairments in those diagnosed with a pervasive developmental disorder (PDD), this study employed the golden section hypothesis, which predicts that people organize their interpersonal judgments in a ratio approximately 62% positive and 38% negative.

Method. The research was done individually, orally and with visual aids by the researcher with 10 participants with a pervasive developmental disability and 10 undergraduate college participants who did not have any disability. Participants were asked to rate 9 cartoon characters (Garfield, Bugs Bunny, Mickey Mouse, Spongebob Squarepants, Snoopy, Elmo, Tasmanian Devil, Scooby Doo, Fred Flintstone) and one self-category using 12 different bi-polar dimensions (generous-stingy, pleasant-unpleasant, true-false, fair-unfair, active-passive, energetic-lethargic, sharp-dull, excitable-calm, strong-weak, bold-timid, hard-soft, rugged-delicate). These dimensions had well-established positive and negative poles.

Results. Both pervasive developmentally disabled and normal participants had average positive ratings of the cartoon characters that were not statistically significant from the golden ratio 0.618. Both of these populations rated themselves in a manner consistent with Lefebvre et al (1986), who predicted that people .71 mean positive self-ratings.

Conclusion. The results indicate that both PDD and non- PDD participants utilize the golden section ratio. The study supports the robustness of this ratio in a clinical population that has not been previously studied. Due to a small sample size, it is necessary to interpret these results with caution. It would be beneficial for further research to replicate this study with more participants.

INTRODUCTION

A great deal of research has been conducted examining the lack of social and interpersonal reciprocity in those diagnosed with autism, pervasive developmental disorder (PDD) and pervasive developmental disorder-not otherwise specified (PDD-NOS). An essential part of what is known about the developmental and neural aspects of human social cognition has come from studying autism and other pervasive developmental disorders (Gallagher, Happe, Brunswick, Fletcher, Frith & Frith, 2000; Gyori, Lukacs, & Pih, 2004). At the same time, golden section studies have contributed to the understanding of how people organize information about others (Benjafield & Pomeroy, 1978; Lefebvre, Lefebvre, & Adams-Webber, 1986; Sally & Hill, 2006). Combining the research of the golden section studies with theories developed to explain social impairments in those with a PDD may contribute to understanding of social cognition and the ways people psychologically organize information. By studying people with social impairments due to PDDs, we may be able to better understand the genesis of social cognition. We may gain insight into how social cognition is organized and embedded within the overall architecture of the brain/mind (Gyori et al., 2004).

Several theories (Theory of Mind, Weak Central Coherence Theory and neurological theories) have been proposed to help explain the nature of those diagnosed with PDD. By exploring these theories in the context of the golden section hypothesis, we may further the knowledge and understanding of the behaviors, thoughts and emotions of those diagnosed with a PDD. Why is it that those with PDD miss social cues, have difficulty with social reciprocity and interaction, have obsessive concerns for sameness, and are preoccupied with specific objects? Perhaps those diagnosed with a pervasive

developmental disorder cannot predict how others will act because they lack the ability to organize information in the same manner that those without this diagnosis take for granted. A review of theories and neurological implications in those diagnosed with autism and/or pervasive developmental disorders follows. The proposed study is an attempt to integrate the ubiquitous golden section research with an impaired population in an effort to aid the understanding of our social cognition.

Pervasive Developmental Disorders and Autism

Pervasive developmental disorders (PDDs) are characterized by severe and pervasive impairment in several areas of development: communication skills, shared interaction skills, and possibly stereotypical repetitive behaviors and/or interests (American Psychiatric Association [APA], 2000). Pervasive developmental disorders are usually present within the first years of life and are often associated with some degree of mental retardation (APA, 2000). There are several diagnoses that fall under the umbrella of PDD: autistic disorder, Rett's Disorder, childhood disintegrative disorder, Asperger's syndrome, and pervasive developmental disorder-not otherwise specified (PDD-NOS) (APA, 2000).

Children who meet the DSM-IV TR criteria (APA, 2000) for PDD-NOS suffer from deficits in social reciprocity and may have impairments in communication and/or a restricted range of interests and behaviors (Sicotte & Stemberger, 1999). Little research has examined the unique characteristics of PDD-NOS; it often shares symptoms with other PDD disorders (i.e. Autism, Asperger syndrome, Mental Retardation) and disorders that typically have onset in early childhood (i.e., Attention Deficit Hyperactivity Disorder, Obsessive Compulsive Disorder) (Sicotte & Stemberger, 1999). In general,

children diagnosed with PDD-NOS are more likely to be higher functioning than children with autism (Sciotte & Stemberger, 1999; Walker, Thompson, Zwaigenbaum, Goldberg, Bryson and Mahoney, Strawbridge & Szatmari, 2004). Those diagnosed with PDD-NOS have fewer repetitive behaviors than those diagnosed with autism or Asperger's syndrome (Walker et al., 2004). However, impairment in reciprocal social interaction among those with PDD-NOS is equivalent to those diagnosed with autism or Asperger's syndrome (Sciotte & Stemberger, 1999; Walker et. al., 2004). Although there are could be many behavioral differences between those with autism, PDD or PDD- NOS, essentially having either of these diagnoses indicates that there are impairments in reciprocal social interaction.

The simple term "social-cognition" includes many aspects of how people make sense of others and their relationships to them, as well as how their brains process social information (Fiske & Taylor, 2008; Gyori et al., 2004). This term encompasses people's interactions, interpersonal organization, communication, attribution of thoughts, interpersonal strategy, mentalizing abilities, and social inference from language pragmatics (Fiske & Taylor, 2008; Gallagher, 2004; Gyori et al., 2004). Interpersonal relationships are a part of social cognition, and an important element of human life. Gyori et al. (2004) and Gallagher (2004), among others, have suggested that the human mind is intrinsically social, meaning that complex social cognition seems to belong to our species-specific biological foundation, determined to a substantial extent by our genetic endowment. Several theories are reviewed next that attempt to explain the lack of social cognition in those diagnosed with PDD-NOS and/or autism.

Theory of Mind

One of the current theories explaining why those with autism and PDD-NOS experience impaired social interaction is that individuals diagnosed with these disorders lack a theory of mind (Gallagher, 2004; Leslie, 1987, 1992; Perner, Frith, Leslie, & Leekam, 1989; Sally & Hill, 2006). This theory suggests that the normal and pervasive way in which people understand one another depends on their implicit or explicit practice of mentalizing or mind-reading (Fodor 1992). This mentalizing is what people use as common sense, creating folk-psychological beliefs about how their own mental states inform people about the behaviors of others (Fodor, 1992; Gallagher, 2004, Wimmer & Perner, 1983). Theory of mind research has suggested that people with pervasive developmental disorders lack “primary inter-subjectivity,” meaning that they are unable to perceive the intentions and emotions of others and, when able, are left to compensate strictly though utilizing logic (Gallagher, 2004). This implies an innate mechanism (specialized neural circuitry), or one that may be acquired through early experience, for the ability of people to attribute intentional thoughts to other people (Gallagher, 2004). A deficit in this capacity might underlie the social pragmatics that are characteristic of pervasive developmental disorders (Roeyers, Buysse, Ponnet, & Pichal, 2001). Gallagher (2004) has proposed that this “primary inter-subjectivity” is something quite basic to human nature in that it may be part of people’s innate genetic endowment. The evidence that children diagnosed with autism lack mentalizing abilities or theory of mind is based on studies that reveal differences in performance in a standard false-belief task between normal four-year old children and those diagnosed with autism (Frith & Happe, 1994; Gallagher, 2004; Leslie, 1987, 1992; Sicotte & Stemberger, 1999).

On average, children of four years old are able to distinguish between what they know to be true and what others may falsely believe (Baron-Cohen & Glidden, 2001). It is around this age that children begin to recognize that other people interpret the world through their own experiences. Understanding this allows children to predict the behavior of others when they have limited or different information available to them (Baron-Cohen & Glidden, 2001). For example, in a standard false-belief task, a child learns that a clearly marked candy box actually contains pennies. The child is then asked what someone else who has not seen the pennies will think is in the box when they see it. Four year olds on average will answer correctly, and will state that the other person will think there are candies in the box. Autistic children and children less than four years old tend to answer incorrectly, answering that the other person will think there are pennies in the box. In other words, autistic children fail false-belief tasks, leading researchers to suggest that those with autism lack a theory of mind, thus explaining their lack of social cognition (Baron-Cohen & Glidden, 2001).

Sciotte and Stemberger (1999) explored this concept further to determine if those diagnosed with PDD-NOS also lack theory of mind and would fail false belief tasks in the same manner that autistic children do. Their results suggest that children with PDD-NOS are deficient in theory of mind abilities, but this relationship is not as strong as in previous studies with autistic subjects (Sicotte & Stemberger, 1999). This implies that that theory of mind exists on a continuum. Social cognition is a developmental structure within our brains and, as such, there seem to be varying degrees to which it exists.

The fact that autistic children tend to fail false-belief tasks does not prove that autistic children lack a theory of mind. The theory of mind does not represent a human

being's innate complex social cognition as a whole, so to attribute a lack of theory of mind as indicating whether an individual understands another's beliefs is problematic. Clearly, a person's ability to attribute mental states to various agents, in order to interpret, explain and predict their actions, plays an important role in our social and interpersonal lives. As central as this role is, there is more to social cognition than what is represented by theory of mind ability. Theory of mind research lends itself to a structured conception of our ability to interact with others (Gyori et al., 2004). Contributing to this concept is the notion that false-belief tasks do not account for interaction with others. When we interact with others, we infer body language, eye gaze, facial expressions, tone of voice, and so forth to help us understand another's intentions (Gallagher, 2004; Happe & Frith, 2006). False-belief tasks demonstrate strongly that something significant happens at about 4 years of age, but it is unclear to what extent it catches the nature of intersubjective understanding (Gallagher, 2004).

False belief tasks do represent a developmental aspect of social cognition. However, they do not account for the pervasive social impairments or biases in those under the umbrella of pervasive developmental disorders (Gallagher, 2004; Ramachandran & Oberman, 2006). If theory of mind is to account for autism's social impairments, there are a significant number of autistic individuals who are capable of passing false-belief tasks and other theory of mind tests (Baron-Cohen & Glidden, 2001; Gallagher, 2004; Gyori et al., 2004; Happe & Frith, 2006; Roeyers et al., 2001). The theories of mind tests are inconsistent in their ability to capture or isolate social impairments in people with a PDD diagnosis (Gyori et al., 2004, Royers et al., 2001). False belief tasks represent one way of capturing social impairments in those diagnosed

with a PDD, but because of some people with a PDD pass this test, other research designs have been used to better understand social impairments in patients with PDDs (Baron-Cohen & Golan, 2001; Gallagher, 2004; Gallagher et al., 2004; Gyori et al., 2004; Roeyers et al., 2001).

The advance mind reading test done with PDD subjects provided evidence for subtle social cognitive deficits in this population as compared to a matched normal control group (Roeyers et al., 2001). In a task titled the Empathic Accuracy Task, both adults with a pervasive developmental disorder and adults without this diagnosis were asked to view two video tapes of two different sets of individuals interacting in a naturalistic way, and then the subjects were asked to rate what they thought the individuals were thinking and feeling in those moments of interaction (Roeyers et al., 2001). The accuracy of these ratings was compared to what the actual targets of the video were feeling. The results indicated that adults with a PDD made less accurate inferences of the unexpressed thoughts and feelings of the targets in video 2, whereas in video 1 the PDD participants were able to understand the target's emotions accurately. Compared to standard false-belief tasks, the subjects had ample access to verbal and non-verbal cues. Having access to this information should have helped them assess the other person's unexpressed feelings and thoughts more clearly and naturally. This type of interaction allows for an interpersonal context. The interpersonal context represents a more natural interpersonal setting, where most inferences of other people's thoughts and feelings are actually made (Roeyers et al., 2001).

In the first video there were no between-groups differences; however, on the second video there were clear differences, making the study both intriguing and

confusing (Roeyers et al., 2001). What is the exact difference between the tapes that could account for the absence of empathic understanding in one videotape, versus the presence of empathic understanding in another? Roeyers et al. (2001) presented some possible suggestions: is the impairment in the adults with PDD due to information processing problems (theory of mind) or is it an attention issue from over arousal in the complex social interaction that is the problem?

Weak Central Coherence Theory

“Weak central coherence” theory is a supplemental theory that was developed by Happe and Frith (2006) to help explain the style of thinking for those with pervasive developmental disorder, specifically autistic spectrum disorders (ASD). Weak central coherence accounts for the variability in social cognition found in those with developmental disorders, by attempting to address both the deficits and assets in ASD (Happe & Frith, 2006). Some individuals with ASD have exceptional perceptual abilities: they are able to name the pitch of a “pop” as a cork comes out of the bottle, or are able to quickly recall and locate an item on a map (Happe & Frith, 2006). For normal children and adults, information processing tends to occur in a gestalt (global) form, often at the expense of detail and accuracy (Happe & Frith, 2006). Frith named this style “central coherence” (Frith & Happe, 1994). It is hypothesized that individuals with ASD display “weak central coherence,” defined by a processing bias for local and detail information and relative failure to extract the global, big picture in everyday life (Frith & Happe, 1994). Autism involves an imbalance in the integration of information and specifically integrating parts into wholes (Gallagher, 2004).

Instead of viewing this type of processing as a core deficit in central processing, manifested in an inability to extract global meaning, it has been recently conceptualized as a processing bias or cognitive style (Frith & Happe, 1994). Recent research has suggested that weak coherence can be achieved in tasks that specifically demand it in those with ASD (Frith & Happe, 1994). Weak central coherence is a theory that attempts to explain one aspect of cognition in those with ASD, namely the inability to extract global meaning due to a cognition preference for details (local bias). This theory differs from theory of mind because it attempts to understand how individuals with ASD understand the world due to a different processing style instead of explaining their behaviors because of inability to understand others intentions (Gallagher, 2004; Happe & Frith, 2006). However, in a review of over fifty empirical studies regarding weak central coherence, it was demonstrated that there were robust findings of a local bias in ASD, with mixed findings regarding weak global processing. Thus, local bias appears not to be a side effect of executive dysfunction and may be independent of theory of mind deficits (Happe & Frith, 2006).

Neurological Implications

It is likely that underlying the theory of mind and weak central coherence hypotheses are the computational and neural underpinnings that cause deficits in social cognition. Research needs to identify brain mechanisms with known functions that match those disrupted in autism and PDD-NOS. Research in determining exactly what parts of the brain are responsible for these theories within socially impaired populations is complex. It would be ideal if one part of the brain was specifically responsible for our social understanding, however the brain is complex and its internal wiring is all

connected. For example, a major limitation for the theory of weak central coherence is the lack of a specification of a mechanism at both cognitive and neural levels that accounts for the detailed-focused processing bias in ASD individuals (Happé & Frith, 2006). However, through the use of technology and ingenious studies we are learning more about what areas of the brain are responsible for our behaviors, thoughts and emotions.

For example, it is known that important structures like the medial prefrontal cortex, the temporal lobe, the amygdala, and supra-temporal sulcus are involved in theory of mind functioning, yet the entire “social brain” involves other structures (Gyori et al., 2004). Researchers (Gallagher et al., 2000; Gyori et al., 2004) have used magnetic resonance imaging (MRI) to determine if there is a functional anatomy for theory of mind. Normal subjects were given verbal and visual theory of mind examples and non-theory of mind examples while their brains were under MRI scan (Gallagher et al., 2000). The medial prefrontal cortex was the only region uniquely activated by theory of mind tasks, providing evidence that the ability to attribute mental states is mediated by this area of the brain (Gallagher et al., 2000).

It is also unknown what exactly occurs within the PDD-NOS or autistic child developmentally at a neurological level. Gallagher (2004) and Happé and Frith (2006), in their reviews of recent research on apoptosis (the natural pruning of the excess of neuronal cells with which we are born), suggest that the normal timing of this process is disrupted in the autistic brain. This disruption in developmental pruning may contribute to weak central coherence by reducing connectivity throughout the brain (Gallagher, 2004; Happé & Frith, 2006). If this natural process is disordered, it is likely that it will

result in a dysfunction of neural structures affecting a person pervasively and developmentally. This disordered process has infinite outcomes, leading to many neurological problems affecting many areas of the brain and therefore resulting in different kinds of processing dynamics.

A number of neurological variations have been proposed to attempt to explain the effects of a disruption in apoptosis. These explanations are based on an overarching reduced connectivity throughout the brain (Happe & Frith, 2006). It is possible that there is a lack of synchronization of activation between neurons, or perhaps a lack of connecting fibers that assist in neural communication. A more thorough working hypothesis offers that brain specialization in ASD develops without normal cross-talk between regions and that weak central coherence results due to the lack of synchronization of the neurons to bind parts into wholes (Happe & Frith, 2006).

Recent research has looked at mirror neurons in how humans feel empathy for one another or understand one another's intentions. Mirror neurons are a newly discovered class of nerve cells in the brain; the networks they are a part of send motor commands, but also enable people to determine the intentions of others by mentally simulating their actions (Ramachandran & Oberman, 2006). For example, in normal people, observing another person pouring a glass of milk results in mirror neurons being activated just as if one was performing the action oneself (Ramachandran & Oberman, 2006). Mirror neuron activation is thought to allow people to understand what they are seeing and to make interpretations and predictions about other people's intentions and behaviors. That is, mirror neurons simulate another's actions in one's own head, as if one was doing the task oneself (Ramachandran & Oberman, 2006). If mirror neurons are

indeed involved in complex intentions, then a breakdown of their neural circuitry could possibly explain the lack of social cognition and interpersonal difficulties that occur in those diagnosed with ASD and/or other PDD disorders. Recent studies using electroencephalogram measurements of the brain's activity have offered compelling evidence that people with ASD have dysfunctional mirror neuron systems (Ramachandran & Oberman, 2006).

Neurological theories, weak central coherence theory, and theory of mind are examples of hypotheses developed to explain how people with PDDs process and understand their worlds, specifically their social impairments/ biases. Golden section studies have been designed to help understand how people organize information, which may involve making interpersonal judgments of others (Benjafield & Green, 1978). Although work from these two fields has not been previously combined, they do have a common purpose, which is to understand how people with or without a PDD diagnosis process and organize information.

Golden Section Studies

Research has indicated that people have a tendency to assign others to the positive pole of bipolar construct dimensions approximately 62% of the time and to the negative pole the remaining 38% of the time (Adams-Webber, 1978; Badesha & Horley, 2000; Benjafield, 1983; Benjafield & Adams-Webber, 1975, 1976; Benjafield & Green, 1978; Kahgee, Pomeroy, & Miller, 1982; Romany & Adams-Webber, 1981). This recurring ratio of, specifically, 61.8% positive ratings to 38.2% negative, is known as the golden section (Benjafield & Adams-Webber, 1976; Benjafield & Green, 1978). The golden section is defined as a ratio between two parts, a and b , so that a is to b as b is to the

whole and is expressed mathematically as $a/b = b/(a+b)$ (Kahgee et al., 1982). The cause of this recurring ratio is unclear. Lefebvre, Lefebvre, and Adams-Webber (1986) have argued that human mental structure is such that people have an “algebraic processor” that assists them in organizing information.

While people tend to assign others to the positive poles of construct dimensions roughly 62% of the time, the percentage is somewhat higher for ratings of self. That is, when people are asked to construe themselves along bipolar construct dimensions (e.g. lethargic-energetic), they generally assign themselves to the positive poles 71% of the time (Lefebvre et al., 1986). Thus, when people are asked to categorize others, the golden section ratio occurs; when asked to categorize self, a higher percentage of positive ratings result. The bipolar dimensions that have been used consistently in golden section studies are: (1) generous-stingy, (2) pleasant-unpleasant, (3) true-false, (4) fair-unfair, (5) active-passive, (6) energetic-lethargic, (7) sharp-dull, (8) excitable-calm, (9) strong-weak, (10) bold-timid, (11) hard-soft, (12) rugged-delicate (Adams-Webber, 1977, 1978; Adams-Webber, 2001, 2004; Benjafield, 1983; Benjafield & Adams-Webber, 1975, 1976; Benjafield & Green, 1978; Lee & Adams-Webber, 1987; Lefebvre et al., 1986; Pomeroy, Benjafield, Rowntree, & Kuiack, 1981).

It is important to note that “positive” and “negative” do not imply “good” and “bad,” but rather stem from ancient Chinese conceptions of Yang and Yin (Benjafield & Adams-Webber, 1976). In Benjafield and Adams-Webber (1976), the discussion of Yang and Yin recognizes that cognition is organized around bipolar dimensions, with one pole being psychologically positive (Yang) and the other negative (Yin). The positive pole of a construct dimension is usually the one that came into language at an earlier date, occurs

more frequently in the language and is first to be used correctly by children (Benjafield & Adams-Webber, 1976). Thus, the positive (Yang) is thought to be an original unity that becomes differentiated into a positive and negative part in a manner consistent with the golden section ratio.

When subjects are asked to make dichotomous judgments about a series of identities in terms of bipolar dimensions, they will use positive adjectives approximately 62% of the time and negative adjectives approximately 38% of the time (Benjafield & Adams-Webber, 1976; Lee & Adams-Webber, 1987). One of the suggestions for the robustness of this recurring ratio is due to the fact that it allows the minor (negative, Ying) to occupy a proportion of the whole (positive, Yang) in a manner that makes it maximally striking (Benjafield & Adams-Webber, 1976; Benjafield & Green, 1978; Benjafield & Pomeroy, 1978; Lee & Adams-Webber, 1987). In this sense, the golden section is a strategy for organizing information, one that allows a person to make negative information stand out against a backdrop of positive information. Lee and Adams-Webber (1987) discussed the golden section as a structural model that is aesthetically pleasing for our minds. It is a way to balance positive and negative information, albeit in an asymmetrical balance of harmony.

Studies confirming that people use the golden section in rating others have frequently been conducted in normal populations (Adams-Webber, 1977; Benjafield & Green, 1978; Benjafield & Pomeroy, 1978). Studies have also been done that demonstrate the golden section occurs cross cultures. Romany and Adams-Webber (1981) demonstrated that 10 year old children from Canada and Trinidad assigned significantly more people to positive poles of bipolar dimensions than did mid-

adolescents in the same countries. The adolescents' assigned others to the positive poles in a manner consistent with the golden section hypothesis (Romany & Webber, 1981). There have even been limited studies completed in populations with schizophrenia (Badesha & Horley, 2000; Kahgee, Pomeroy & Miller, 1982). Kahgee, Pomeroy and Miller (1982) conducted a study showing that thought disordered individuals rate acquaintances according to the golden section ratio. Badesha and Horley (2000) recently confirmed this, finding that the golden section held true for psychiatric outpatients rating themselves and others. Lee and Adams-Webber (1987) even confirmed the golden section hypothesis in ratings of cartoon characters by adolescent subjects. Cartoon characters were used because it was impossible for any of the adolescents to have had interpersonal experiences with them. Lee and Adams-Webber (1987) argued that the cartoon characters serve as a stimulus for a projective test of the golden section hypothesis. They considered the adolescents' answers to be representative of an underlying mechanism (i.e., an algebraic processor) in operation versus a distortion affected by the influence of actual interpersonal experience. The answers that cartoon characters illicit were thought to be directly linked to the way in which people organize information, a non-biased, purely operational mode of systematizing the external world. Across this research, the golden section did occur when adolescents or people diagnosed with schizophrenia were asked to characterize people or cartoon characters using bipolar construct dimensions.

Though these studies have shown evidence of the golden section in some clinical populations, most other clinical populations have yet to be studied. A particular population of interest is those with pervasive developmental disorders. Gallagher's

(2004) “primary inter-subjectivity” explained in the theory of mind research is analogous to Lefebvre’s et al’s., (1987) “algebraic processor,” or optimal state, which suggests that people have an ideal way of organizing information that is expressed through the golden section. Both theories suggest that this processing is something genetically endowed in humans or is developed neurologically through experiences as people develop. If this is impaired in the PDD population, then the way PDD patients organize information should not be in accordance with the golden section.

Weak central coherence theory is an attempt by Happe and Frith (2006) to explain the style of thinking for those with a pervasive developmental disorder, specifically autism spectrum disorders (ASD). To display weak central coherence is to have a processing bias for local and detail information, along with a relative inability to extract the global, big picture in everyday life (Frith & Happe, 1994). An argument can be made that people with weak central coherence might struggle to organize information according to the golden section ratio because, as Benjafeld and Adams-Webber (1975) make clear, the golden section ratio is a way for people to organize information whereby negative or peculiar situations stand out against more mundane, positive occurrences. Yet, according to Happe and Frith (2006), it is the opposite that happens with those who are diagnosed with a PDD. Those diagnosed with a PDD tend to have difficulty processing information globally and instead overemphasize peculiar, detailed events. If those with a PDD do not rate others according to the golden section hypothesis, then one could argue that this provides support for weak central coherence theory.

It remains undetermined what physical, psychological and/or neurological aspects are interacting in a way that manifests a deficit in social cognition for those diagnosed on

the PDD spectrum. However, the human tendency to utilize the golden ratio has been replicated repeatedly and appears quite robust. That is, the golden section ratio is a recurrent mechanism by which people make sense of their experiences. If the golden section is an ideal schema or an abstract representation of classes of events and serves as a reference point for ordering experiences, perhaps this abstract schema or ideal is what is missing in those diagnosed with a pervasive developmental disorder, thus potentially accounting for their social deficits. If this is the case, combined with the information about the way those with autism and PDD-NOS process information, a study examining if this population adheres to the golden ratio was deemed relevant. Such a study was conducted in an attempt to contribute to the body of knowledge pertaining to social impairments in the PDD population.

Hypothesis

Hypothesis 1: College students will rate cartoon characters according to the golden section hypothesis. It is predicted that college students will rate cartoon characters according to the golden section hypothesis because it is assumed they are not on the autistic spectrum nor do they have any developmental disabilities, and are thus believed to be a “typical” population. The golden section predicts that the mean percentage of positive ratings for the cartoon characters will be 0.618. There are several studies demonstrating the robustness of the golden section through the use of the bi-polar constructs and different identities (Adams-Webber, 1978; Badesha and Horley, 2000; Benjafield, 1983; Benjafield & Adams-Webber, 1975; Benjafield & Green, 1978; Kahgee, Pomeroy & Miller, 1982; Romany & Adams-Webber, 1981).

Hypothesis 2: People diagnosed with pervasive developmental disorders will not rate cartoon characters in accordance with the golden section. Because people diagnosed with pervasive developmental disorders have difficulty in organizing information and processing social information it is predicted that they will not rate cartoon characters in accordance with the golden section. Their mean positive ratings for cartoon characters was expected to differ statistically from the golden section mean of 0.618.

Hypothesis 3: College students' self-ratings will be in accordance to Lefebvre et al's. (1986) .71 approximation. Ratings of self were expected to be more positive than the golden ratio for the "typical" population, in keeping with Lefebvre et al.'s prediction that people typically rate themselves using the positive end of construct dimensions 71% of the time.

Hypothesis 4: People diagnosed with pervasive developmental disorders' self-ratings will not be in accordance to Lefebvre et al's. (1986) .71 approximation. It was not anticipated that people diagnosed with pervasive developmental disabilities would rate themselves positively 71% of the time because it was assumed that their diagnoses would interfere with self-construal.

METHOD

Participants with Pervasive Developmental Disabilities

Nineteen participants were recruited from a residential agency (located in New York's Hudson Valley) for adults and children on the autistic spectrum and/or diagnosed with other pervasive developmental disorders. Nineteen out of fifty-four residents were selected because it was presumed that these participants would be most likely to complete

the study given their verbal abilities. Out of the nineteen participants recruited, thirteen consents were received from the participants' guardians. One of the participants consented for himself. Out of 14 participants who consented, 10 were able to complete the study. Three individuals were excused from the study because they were unable to keep focused, did not grasp the content of the study, or it was in their best interest to discontinue the study due to irritability. One PDD participant who was recruited did not assent to participate.

The participants came from a variety of ethnic backgrounds (6 Caucasian, 1 Hispanic/Latino, 1 African-American, and 2 Other). Of the 10 participants, 8 were male and 2 were female. Their mean age was 27.1 ($SD=6.35$). All of the participants were diagnosed on the pervasive developmental disorder spectrum. Out of the 10 participants, 7 of them were also diagnosed with mild to moderate mental retardation. Two of the participants were diagnosed on the autistic spectrum. One of the participants was diagnosed with PDD-NOS. Among the 10 participants, 7 of them had dual diagnoses that included one or more of the following disorders: attention deficit hyperactivity disorder, intermittent explosive disorder, impulse control disorder, obsessive control disorder, seizure disorder, and bipolar disorder. All participants were receiving standard dosages of psychotropic medications at the time of the study.

Participants without a Pervasive Developmental Disability

Participants were also recruited from the State University of New York at New Paltz subject pool who were undergraduate psychology majors. A total of 10 participants were surveyed. Of the 10 participants who completed the study, 7 were female and 3 were male. The participants came from a variety of ethnic backgrounds (7 Caucasian, 1

Asian American, 1 African-American, and 1 Other). Their mean age was 22.9 ($SD=4.75$). There was an inverse ratio of females to males between the two groups of participants (i.e., 8 males in the PDD sample and 7 females in the non-PDD sample). However, it was not suspected that this gender difference would impact the results of the study. Although gender could be a concern, there is no data in the golden section literature to suggest that gender affects the way people organize information as it pertains to the golden section ratio.

Materials

Regardless of the populations, the researcher documented all of the participants' answers on a paper that had all the identities and bipolar constructs listed. Ten identities were randomly listed across the top of the page with nine of them being cartoon characters and one self-category (Garfield, Bugs Bunny, Mickey Mouse, Spongebob Squarepants, Snoopy, Elmo, Tasmanian Devil, Scooby Doo, Fred Flintstone and Self). These cartoon characters were selected because the researcher inquired with the PDD participants prior to the study's approval to determine what possible cartoon characters would be familiar to them. Down the left side of the page, 12 pairs of adjectives (i.e., bipolar construct dimensions) were provided (generous-stingy, pleasant-unpleasant, true-false, fair-unfair, active-passive, energetic-lethargic, sharp-dull, excitable-calm, strong-weak, bold-timid, hard-soft, rugged-delicate). These descriptors represent three differential components of connotative meaning: evaluation, activity, and potency (Benjafield & Adams Webber, 1976). Several previous golden section studies have successfully used these adjectives (Adams- Webber, 2004; Adams-Webber, 1978; Badesha & Horley, 2000; Benjafield, 1983; Benjafield & Adams-Webber, 1975, 1976;

Benjafield & Green, 1978; Kahgee et al., 1982; Romany & Adams-Webber, 1981), making them an obvious choice for the proposed study. The resulting document was a 10 x 12 grid. The orders of the positive and negative poles of the adjective pairs were varied for the identities so that the positive pole was not always presented first.

The current study used cartoon characters instead of different identities for two reasons. First, it was hypothesized that cartoon characters are concrete identities that the PDD participants would understand. It was felt that using a vague identity (e.g. policeman, or nurse) might have been too abstract for PDD participants and could have led to confusion. Second, in order to test whether the PDD population applied the golden ratio to the cartoon characters due to a deficit in computational mechanism (Lefebvre et al., 1986) or any underlying mediating process, it seemed best to present fictional characters with whom the subjects never had any direct interaction, in order to prevent subjective experiences that could skew the results (Lee & Adams-Webber, 1987). Participants were presumably not influenced by any interactions with cartoon characters (verses interactions with a nurse or a mother as an identity) and so, as in previous research testing the golden section hypothesis using cartoon characters, the stimuli were conceptualized as a “projective test” of the golden section hypothesis (Lee & Adams-Webber, 1987). For this study, the cartoon characters were presented to the participants through a visual aid. The visual aids were 4 x 6 laminated color pictures of the cartoon characters.

Procedure

The 10 x 12 grid document that was used by the researcher was modeled on the one used by Lee and Adams-Webber (1987). For the PDD participants the investigator

went to each Individual Residential Alternative (IRA) individually to conduct the research. While at the IRA, the researcher utilized a private space in the house. The interaction was only between the researcher and participant. This increased attentiveness and allowed the research to be conducted with minimal distractions. For the non-PDD participants the study was conducted individually in a campus lab to minimize distractions. The experimental procedure was explained to both the PDD and non-PDD participants through the use of a script and visual aids. It was explained to all participants that they would be presented with a picture of a cartoon character (e.g., Garfield). The researcher explained that for every cartoon character presented, the participant would need to choose between two words that best describe the cartoon character. These words were provided in a sentence to make sure they were understood. For example “Is Garfield generous or stingy?” For each construct dimension, the participant was asked to choose one word or the other that best applied to the cartoon character. However, due to the limitations of the PDD population, some of Osgood and Richard’s (1973) original words were simplified so that participants understood their meaning (e.g., stingy-cheap, bold-outgoing, delicate-breakable, lethargic-lazy, generous-giving, timid-shy, rugged-rough). The original words and their synonyms are presented in Table 1. This was necessary because some of the constructs were not familiar to some of the PDD participants. The researcher asked the participant the question using the original bipolar constructs first with the first identity (Garfield), and then asked the PDD participants whether they knew what the words meant (e.g., “Do you know what generous means?”). If the participant answered no, the synonyms were provided to help explain the word. Some of the participants did know what the words meant and others did not. Once a synonym was

given to assure they understood the term, all of the PDD participants preferred to use the more simplistic term for the identities. After it was established that the synonyms were needed, the researcher presented the original words with the synonyms for each of the bipolar constructs. For example “Is Garfield generous-giving or stingy-cheap?” The synonyms were not used for the non-PDD participants because it was assumed they understood the meaning of the bipolar constructs.

The researcher utilized the same script for both participant populations. The script provided simple and explicit directions for the participants to follow. Within the body of the script there were prompts to assure that both the PDD and non-PDD participants understood the meaning of the bipolar adjectives. There were also built-in break procedures within the body of the script. Once any participant completed three cartoon identities they were offered three minutes for a break. Only two breaks were allowed per session. If a participant asked to take a third break or if the researcher sensed fatigue (losing focus, easily distracted) from one of the PDD participants, then the researcher asked them if they would rather continue on another day. This procedure was put in place because it was believed that the study would be a challenging task for those diagnosed with a PDD. In order for the study to be completed correctly it was assumed that breaks and/or multiple sessions would be needed for the PDD participants. Lastly, none of the participants were allowed to exceed 35 minutes in one session, as this was deemed a long time for people with a PDD to focus.

The researcher spent approximately 15-35 minutes with each participant, presenting each visual picture of the cartoon character and verbally providing sentences that included Osgood’s (1973) bipolar construct dimensions and/or the modified versions

of them. Eight out of the 10 PDD participants utilized the break time that was offered to them after they rated three identities. Three out of the 10 participants utilized one extra session to finish all 10 identities. Because the non-PDD participants did not possess cognitive deficits as the PDD participants did, all of the non- PDD participants did not use breaks and completed the survey in one session.

There was a concern that some of the PDD participants might engage in echolalia and simply repeat the last word that they heard the researcher ask. To prevent mimicry, the order of the bipolar constructs was reversed for 4 of the cartoon characters and self. If one of the PDD participants appeared to be mimicking the last adjective provided for 3 or more consecutive cartoon characters, the investigator stopped the procedure. This happened to one participant. The researcher then read the study's directions from the script again to the participant and reminded the participant to ask for help if the participant did not understand the meaning of the words. The synonyms were provided as well. The participant was not able to complete the study as asked because he kept repeating the last word he had heard from the researcher. It was clear that this participant did not comprehend the instructions of the study and was therefore excused. The researcher did not include this participant's data in the study.

After the participants rated nine cartoon characters, they were then asked to rate themselves using the bipolar constructs. The researcher explained to the participants that they would now rate themselves. To prevent confusion, it was necessary to use each participant's name in a sentence (e.g. "Is John Doe dull or sharp?"). The researcher wrote down all the participant's answers.

RESULTS

There was a total of 108 possible positive adjective ratings across all cartoon characters for each participant and a total of 12 possible positive adjective ratings for the self-category for each participant. In order to calculate the average positive ratings for both the PDD and non-PDD groups, the number of the positive adjectives chosen was added together for each cartoon character and self-category. Once all of the positive ratings of each cartoon character were summed for both the PDD and non-PDD participants, the total was divided by 108. The results constitute the mean percentage of positive ratings for each cartoon character for each group. Descriptive statistics are available in Table 2, 3, and 4. Once the mean positive percentage was determined, one-sample t-tests were used to compare these percentages to either the golden section ratio (.618) or the predicted self-rating percentage (.71), depending on which hypothesis was being analyzed.

Hypothesis 1: College students will rate cartoon characters according to the golden section. The golden section hypothesis predicts that the mean percentage of positive adjective ratings should be 0.618. It was hypothesized that non-PDD participants would rate the cartoon characters in accordance with the golden section hypothesis because of their lack of a disability and the robustness of the golden section in “typical” populations. This hypothesis was confirmed, as the mean number of positive ratings for cartoon characters ($M=.665$, $SD=.088$) was not significantly different than the golden section ratio of 0.618, $t(10)=1.703$, $p=.123$.

Hypothesis 2: People diagnosed with pervasive developmental disorders will not rate cartoon characters in accordance with the golden section. It was believed

that the PDD participants' positive ratings of cartoon characters would not be in accordance with the golden section hypothesis because of their disability. The results of the study did not confirm this hypothesis, instead suggesting that people diagnosed with a PDD do utilize the golden section ratio when organizing information. That is, the mean number of positive adjectives used by the PDD participants ($M=.58$, $SD=.116$) was not statistically different from the positive golden section mean of .618, $t(10)=-1.013$, $p=.337$.

Hypothesis 3: College students' self-ratings will be in accordance to Lefebvre et al's. (1986) .71 approximation. Ratings of self were expected to be more positive than the golden section ratio and consistent with Lefebvre et al.'s (1986) prediction of .71. The mean number of positive adjectives college students applied to themselves was ($M=.80$ $SD=.142$.), which was not statistically different from .71, $t(10)=1.994$, $p=.077$. This hypothesis was supported.

Hypothesis 4: People diagnosed with pervasive developmental disorders' self-ratings will not be in accordance to Lefebvre et al's. (1986) .71 approximation. It was not anticipated that the PDD participants would rate themselves positively 71% of the time; however, this hypothesis was not confirmed. The results indicated that PDD participants did rate themselves in accordance with Lefebvre et al.'s (1986) .71 approximation, $t(10)=-.160$, $p=.876$. In fact the PDD participants mean positive self-rating was almost exactly .71 ($M=.70$, $SD=.197$.)

Both college student and PDD participants rated the cartoon characters according to the golden section hypothesis. Therefore, after examining the four hypotheses, a decision was made to calculate the mean percentage of positive adjectives assigned

across both the PDD and college student participants. Not surprisingly, the combined score of the positive ratings for both the PDD and non- PDD participants was very much in accordance with the golden section hypothesis, with the mean for the positive ratings being exactly 62% ($M=.623$, $SD=.110$).

DISCUSSION

PDD and Non-PDD Participants' Use of the Golden Section

People diagnosed with a PDD utilized the golden section ratio. That is, the mean number of positive and negative adjectives they assigned to cartoon characters was in accordance with the ratio .618: .382. This was a surprising result, as it was not anticipated that people with a PDD would utilize the golden section ratio. Given that the PDD diagnosis exists on a spectrum, this study's results are specific to those individuals with a PDD who possess verbal skills and are considered to be higher functioning. Individuals with a PDD who lacked verbal skills were not able to complete this study, therefore the results cannot be generalized to all those diagnosed on the PDD spectrum.

The hypothesis that those without a PDD would use the golden section ratio in rating cartoon characters was also confirmed. Given that both PDD and non-PDD participants used the golden section, it was not surprising that the combined positive adjectives mean for both the PDD and non-PDD participants was almost identical to the positive golden section mean of .618 ($M=.623$, $SD=.110$).

Self-Ratings

People diagnosed with a PDD rated themselves in the same way as people who were not diagnosed with a PDD, as predicted by Lefebvre et al. (1986). The PDD participants' mean positive self rating ($M=.70$, $SD=.197$) came very close to the .71 that

Lefebvre et al. (1986) predict. While the non-PDD participants' self-ratings were not quite as close to .71 ($M = .80$ $SD = .142$), they were not significantly different from it either. This tentatively suggests that a PDD may not impair the way people typically evaluate themselves.

General Thoughts and Possibilities

This study provides initial and tentative evidence that those with PDD diagnoses are able to rate themselves and others in a manner consistent with what the golden section hypothesis and related research predict. Despite having a developmental disability, people with a PDD diagnosis may be capable of organizing information in the same manner that non-PDD people do. It remains unclear what the implications of these results are for PDD research rooted in theory of mind, weak central coherence theory, or neurological theories. The relevance of the golden section hypothesis for considering theory of mind, weak central coherence, and neurological theories as they relate to developmental disabilities requires further theoretical and empirical examination. One intriguing possibility, however, is that the golden section hypothesis is tapping into cognitive abilities that are not fully accounted for in current theory of mind and related theories of PDDs. Perhaps the hypothesized mechanism that impairs theory of mind in those with PDDs retains the ability to organize information according to the golden section ratio. However, it is also possible that the golden section hypothesis was confirmed in this study because the presumed mechanism behind it is independent of whatever mechanism impairs theory of mind and leads to weak central coherence. The results of this study indicate that we need further research in order to more fully comprehend the reasons for such intriguing results. Not only is caution called for

because this was the first study to ever explore use of the golden section ratio in the PDD population, but caution is also wise because the study has a small sample size and low power.

The Issue of Power

Power may be defined as the likelihood of correctly rejecting the null hypothesis. In other words, it is the probability of rejecting the null hypothesis given that the null is incorrect. In this study, there was a small sample size for both the PDD participants ($N=10$) and non-PDD participants ($N=10$). It is important to examine the power of the study given the small number of participants. Power helps determine whether the probability of the data collected in a study is sufficient enough to reject the null hypothesis.

For Hypothesis 1, the non-PDD participants' mean positive ratings of the cartoon characters was not significantly different from the golden section ratio of .618. Therefore the null hypothesis was retained. However, the null hypothesis in this instance was what was being predicted. Thus, our hypothesis was supported that non-PDD participants would rate cartoon characters in accordance with the golden section. A power analysis was performed using G*Power 3, a freeware computer program (Faul, Erdfelder, Lang, & Buchner, 2007). The probability that non-PDD participants' mean positive rating scores of cartoon characters was not significantly different than the golden section ratio of .618 is 60% (Power = 0.60, effect size $d=0.8$). Due to the low statistical power, it is hard to determine whether or not the non-PDD participants used the golden section ratio to rate the cartoon characters or whether the confirmation of the null hypothesis was due to low power.

For Hypothesis 2, it was expected that PDD participants' average positive ratings of cartoon characters would be significantly different than the positive golden section mean of .618. However, this hypothesis was disconfirmed as the participants' mean positive rating of cartoon characters was not significantly different than .618. The null hypothesis was once again retained. However, unlike with Hypothesis 1, in this case rejecting the null would have confirmed what was hypothesized. Due to the small sample size, the probability of the data collected not being significantly different from the golden section ratio is 60% (Power = .60, effect size $d = .08$). It may be that the failure to confirm this hypothesis was due to low power rather than due to PDD participants rating cartoon characters according to the golden section.

Because there were a small number of participants in the study, its power was affected. Understanding that the study has low statistical power is important in considering the results. Both non-PDD and PDD participants may have utilized the golden section ratio when rating cartoon characters or the results could be a product of low power. Due to this uncertainty it is important to be cautious drawing interpretations or conclusions from the results. Nevertheless, the interesting and unexpected results of this study are noteworthy and warrant further research.

Future Research

Although this is a preliminary study and is the first of its kind, the results are promising, yet they are difficult to interpret given the small number of participants. It would be of benefit to include more participants with a PDD in future research that examines use of the golden section ratio in people with a PDD. The PDD participants are a difficult population to study given both the nature of their disability and the limited

access to this population. If this study were to be replicated, thirty- five participants would be needed in order to obtain a medium effect size of .8 ($d = .05$), resulting in much more significant power. A study utilizing this many participants with a developmental disability would be of additional interest because it would potentially replicate and confirm this study's tentative results.

Besides future studies increasing the number of participants with a PDD, it would also be beneficial to design a study that incorporates those diagnosed with a PDD who do not possess verbal skills. Given that the present study only included higher functioning verbal individuals with a PDD, it is difficult to generalize the results to the PDD population as a whole. It would be interesting to investigate whether or not non-verbal individuals with a PDD utilize the golden section. This would shed light on the cognitive functioning of those with a PDD who are unable to communicate verbally. Future research might test non-verbal participants with a PDD by showing them pictures with dimensions that both do and do not approximate the golden section ratio; if the non-verbal participants prefer pictures that use the golden section ratio over those that do not, this would provide evidence that even non-verbal people with PDD diagnoses may rely on the golden section in organizing information. In order to better understand the connections and any possible implications of the golden section hypothesis and theories developed to understand pervasive developmental disabilities, more research is necessary.

TABLES

Table 1	
Osgood and Richard's (1973) original words and their synonyms	
<u>Original Constructs (positive words listed first)</u>	<u>Synonyms</u>
<i>Generous-Stingy</i>	<i>Giving- Cheap</i>
<i>Pleasant-Unpleasant</i>	
<i>True-False</i>	
<i>Fair-Unfair</i>	
<i>Active- Passive</i>	
<i>Energetic- Lethargic</i>	<i>-Lazy</i>
<i>Sharp-Dull</i>	
<i>Excitable-Calm</i>	
<i>Strong- Weak</i>	
<i>Bold- Timid</i>	<i>Outgoing-Shy</i>
<i>Hard-Soft</i>	
<i>Rugged- Delicate</i>	<i>Rough- Breakable</i>

Table 2						
Descriptive Statistics- PDD						
<u>Identities</u>	<u>N</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Sum</u>	<u>%</u>	<u>Std. Deviation</u>
<i>Garfield</i>	10	2.00	10.00	55.00	.458	2.50555
<i>Bugs Bunny</i>	10	3.00	9.00	70.00	.583	1.76383
<i>Mickey Mouse</i>	10	3.00	10.00	79.00	.658	2.46982
<i>Spongebob Squarepants</i>	10	4.00	10.00	69.00	.575	2.07900
<i>Snoopy</i>	10	5.00	11.00	79.00	.658	1.85293
<i>Elmo</i>	10	4.00	9.00	71.00	.591	2.02485
<i>Tasmanian Devil</i>	10	5.00	10.00	72.00	.600	1.61933
<i>Scooby Doo</i>	10	5.00	11.00	86.00	.716	1.83787
<i>Fred Flintstone</i>	10	4.00	10.00	76.00	.596	2.11870
<i>Self</i>	10	5.00	12.00	84.00	.700	2.36643

Table 3						
Descriptive Statistics- Non- PDD						
<u>Identities</u>	<u>N</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Sum</u>	<u>%</u>	<u>Std. Deviation</u>
<i>Garfield</i>	10	1.00	10.00	49.00	.408	2.76687
<i>Bugs Bunny</i>	10	8.00	11.00	98.00	.816	1.22927
<i>Mickey Mouse</i>	10	7.00	10.00	91.00	.758	1.10050
<i>Spongebob Squarepants</i>	10	6.00	11.00	81.00	.675	1.72884
<i>Snoopy</i>	10	4.00	11.00	78.00	.650	2.61619
<i>Elmo</i>	10	6.00	11.00	81.00	.675	1.66333
<i>Tasmanian Devil</i>	10	4.00	11.00	85.00	.708	2.01384
<i>Scooby Doo</i>	10	4.00	11.00	74.00	.616	2.11870
<i>Fred Flintstone</i>	10	4.00	11.00	82.00	.683	2.52982
<i>Self</i>	10	6.00	12.00	96.00	.800	1.71270

<u>Identities</u>	<u>N</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Sum</u>	<u>%</u>	<u>Std. Deviation</u>
<i>Garfield</i>	20	1.00	10.00	104.00	.433	2.58742
<i>Bugs Bunny</i>	20	3.00	11.00	168.00	.700	2.06219
<i>Mickey Mouse</i>	20	3.00	10.00	170.00	.708	1.96013
<i>Spongebob Squarepants</i>	20	4.00	11.00	150.00	.625	1.96013
<i>Snoopy</i>	20	4.00	11.00	157.00	.654	2.20705
<i>Elmo</i>	20	4.00	11.00	152.00	.633	1.87504
<i>Tasmanian Devil</i>	20	4.00	11.00	157.00	.654	1.89945
<i>Scooby Doo</i>	20	4.00	11.00	160.00	.666	2.02614
<i>Fred Flintstone</i>	20	4.00	11.00	158.00	.658	2.29186
<i>Self</i>	20	5.00	12.00	180.00	.750	2.10263

REFERENCES

- Adams-Webber, J. (1977). The golden section and structure of self-concepts. *Perceptual and Motor Skills*, 45(3), 703-706.
- Adams-Webber, J. (1978). A further test of the golden section hypothesis. *British Journal of Psychology*, 69(4), 439-442.
- Adams-Webber, J. R. (2004). The 'range of convenience' of personal constructs and confidence in evaluating self. *Journal of Constructivist Psychology*, 17(1), 61-68.
- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed, text revision.) Washington, DC: APA.
- Badesha, J., & Horley, J. (2000). Self-construal among psychiatric outpatients: A test of the golden section. *British Journal of Medical Psychology*, 73(4), 547-551.
- Baron-Cohen, S., & Glidden, L. M. (2001). *Theory of mind and autism: A review*. San Diego, CA, US: Academic Press.
- Benjafield, J. (1983). Some psychological hypotheses concerning the evolution of constructs. *British Journal of Psychology*, 74(1), 47-59.
- Benjafield, J., & Adams-Webber, J. (1975). Assimilative projection and construct balance in the repertory grid. *British Journal of Psychology*, 66(2), 169-173.
- Benjafield, J., & Adams-Webber, J. (1976). The golden section hypothesis. *British Journal of Psychology*, 67(1), 11-15.
- Benjafield, J., & Green, T. R. (1978). Golden section relations in interpersonal judgement. *British Journal of Psychology*, 69(1), 25-35.
- Benjafield, J., & Pomeroy, E. (1978). A possible ideal underlying interpersonal descriptions. *British Journal of Social & Clinical Psychology*, 17(4), 339-340.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175-191.
- Fiske, S. T., & Taylor, S.E. (2008). *Social cognition: from brains to culture*. New York, New York: McGraw-Hill Higher Education.
- Fodor, J.A. (1992). A theory of the child's theory of mind. *Cognition*, 44, 283-296.
- Frith, U., & Happe, F. (1994). Autism: Beyond 'theory of mind.' *Cognition*, 50(1), 115-132.

- Gallagher, H. L., Happe, F., Brunswick, N., Fletcher, P. C., Frith, U., & Frith, C. D. (2000). Reading the mind in cartoons and stories: an fMRI study of 'theory of the mind' in verbal and nonverbal tasks. *Neuropsychologia*, 38(1), 11-21.
- Gallagher, S. (2004). Understanding interpersonal problems in autism: interaction theory as an alternative to theory of mind. *Philosophy, Psychiatry, & Psychology*, 11(3), 199-217.
- G*Power Data Analysis Examples Power analysis for one-sample t-test. UCLA: Academic Technology Services, Statistical Consulting Group. from <http://www.ats.ucla.edu/stat/sas/notes2/> (accessed October 23, 2008).
- Gyori, M., Lukacs, A., & Pih, C. (2004). Towards the Understanding of the Neurogenesis of Social Cognition: Evidence from Impaired Populations. *Journal of Cultural and Evolutionary Psychology*, 2(3), 261-282.
- Happe, F., & Frith, U. (2006). The Weak Coherence Account: Detail-focused Cognitive Style in Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 36(1), 5-25.
- Kahgee, S. L., Pomeroy, E., & Miller, H. R. (1982). Interpersonal judgements of schizophrenics: A golden section study. *British Journal of Medical Psychology*, 55(4), 319-325.
- Lee, C., & Adams-Webber, J. (1987). A 'projective' test of the golden section hypothesis. *Social Behavior and Personality*, 15(2), 169-175.
- Lefebvre, V. A., Lefebvre, V. D., & Adams-Webber, J. (1986). Modeling an experiment on construing self and others. *Journal of Mathematical Psychology*, 30(3), 317-330.
- Leslie, A. M. (1987). Pretense and representation: The origins of 'theory of mind.' *Psychological Review*, 94(4), 412-426.
- Leslie, A. M. (1992). Pretense, autism, and the theory-of-mind module. *Current Directions in Psychological Science*, 1(1), 18-21.
- Osgood, C.E., & Richards, M. M. (1973) From yank and yin to and or but. *Language*, 49 380-412.
- Perner, J., Frith, U., Leslie, A. M., & Leekam, S. R. (1989). Exploration of the autistic child's theory of mind: Knowledge, belief, and communication. *Child Development*, 60(3), 689-700.
- Pomeroy, E., Benjafield, J., Rowntree, C., & Kuiack, J. (1981). The golden section: A convenient ideal? *Social Behavior and Personality*, 9(2), 231-234.

- Ramachandran, V., & Oberman, L. (2006) Broken mirrors: a theory of autism. *Scientific American* 295 (5), 62-69.
- Roeyers, H., Buysse, A., Ponnet, K., & Pichal, B. (2001). Advancing advanced mind-reading tests: Empathic accuracy in adults with a pervasive developmental disorder. *Journal of Child Psychology and Psychiatry*, 42(2), 271-278.
- Romany, S., & Adams-Webber, J. R. (1981). The golden section hypothesis from a developmental perspective. *Social Behavior and Personality*, 9(1), 89-92.
- Sally, D., & Hill, E. (2006). The development of interpersonal strategy: Autism, theory-of-mind, cooperation and fairness. *Journal of Economic Psychology*, 27(1), 73-97.
- Sicotte, C., & Stemberger, R. M. T. (1999). Do children with PDDNOS have a theory of mind? *Journal of Autism and Developmental Disorders*, 29(3), 225-233.
- Walker, D., Thompson, A., Zwaigenbaum, L., Goldberg, J., Bryson, S., Mahoney, W., Stawbridge, C., & Szatmari, P. (2004). Specifying PDD-NOS: a comparison of PDD-NOS, asperger syndrome and autism. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43 (2), 172-181.
- Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining functions of wrong beliefs in young children's understanding of deception. *Cognition*, 13,103-128.