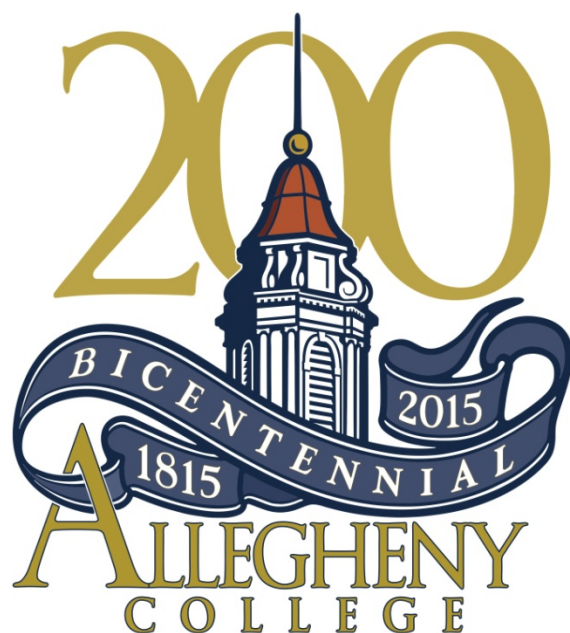


The Effect of Socialization Factors on Empathizing and Systemizing Traits in College Students



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The Effect of Socialization Factors on Empathizing and Systemizing in College Students

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Abstract

Research indicates that someone's empathizing and systemizing traits are predetermined at birth (Focquart et al., 2007). This current research looked to see if factors of socialization and the environment, specifically socioeconomic status, parents, parenting styles, siblings, sibling relationships, and sex affect a person's empathizing and systemizing traits. Participants (N=99), consisting of male (n=17) and female (n=82) undergraduate students, took an online survey including measures of these various environmental factors along with the Empathizing Quotient and Systemizing Quotient. Results did not indicate any significant relationship between socialization factors and Empathizing Quotient and Systemizing Quotient scores, besides a significantly positive relationship between Sibling Relationship Questionnaire Warmth and a participant's Empathizing Quotient score. This result indicates that the socialization factor of sibling relationships may impact a person's Empathizing Quotient score. Insignificant results related to the other environmental factors could be a result of instruments used in this research that did not effectively capture the environmental factor that they were intended to. Other results indicated a difference between male and female participants regarding both the Empathizing Quotient and the Systemizing Quotient and a difference between sophomores and juniors on the Systemizing Quotient. Future research should investigate these environmental factors, in a variety of samples, to comprehensively understand the relationships between these factors and empathizing and systemizing traits in neurotypical males and females.

Introduction

Empathizing Systemizing Theory

Autism Spectrum Disorder is a neurodevelopmental disorder that is defined by its deficits in social communication and repetitive behaviors (Lord et al., 2000). This disorder usually becomes noticed between infancy and three years of age. Asperger syndrome (AS) is a high functioning neurodevelopmental disorder closely related to ASD; it is distinguished by a lack of empathy, difficulty in forming friendships, one-sided conversations, and passionate interests in specific topics (Lawson et al., 2004). Although AS is very similar to ASD, no diagnosis is ever the same, as every individual on the spectrum has a different profile. However, certain aspects remain consistent for everyone on the spectrum. One of the main areas that apply to people with ASD is the difficulty to carry out conversations and use appropriate eye contact and gestures (Lord et al., 2000). This significant delay in language and cognitive development can be explained by the empathizing-systemizing theory.

The empathizing-systemizing (E-S) theory proposed by Baron-Cohen looks into the social and communication problems that people with an Autism Spectrum Disorder face (Baron-Cohen, 2011). This theory states that deficits in empathy occur for people on the spectrum. Empathy consists of two components: the cognitive component and the response component. The cognitive component refers to the Theory of Mind, which is the ability to put oneself into someone else's shoes and to imagine their thoughts and feelings. We are not only able to make sense of another person's behavior, but as well as predict what he or she may do next. For example, we can explain that a man suddenly swivels his neck because he saw something of interest. Those on the spectrum experience a delay in this area, which is visibly seen in their

difficulties with socializing and communication. The response element refers to having the appropriate emotional reaction to another person's thoughts and feelings (Baron-Cohen, 2011).

Although these deficits in empathy are present, people with an ASD portray strong skills in the area of systemizing (Baron-Cohen, 2011). Systemizing is considered the drive to analyze or construct systems. These systems may consist of ones that are collectible, mechanical, numerical, abstract, natural, social, or motoric. In these systems, people with an ASD pay attention to tiny details. People on the spectrum may show this attention to detail when "stimming", or the performance of self-stimulating repeated actions (Baron-Cohen, 2011). With these repetitive actions, people on the spectrum may intently look at a system numerous times to understand the science behind it. According to this proposition, the reason behind a stimming behavior like shaking a string many times might be to understand the physics behind the string's movement (Baron-Cohen, 2011).

Evidence for this empathizing-systemizing theory consists of studies using the Systemizing Quotient (SQ) (Wakabayashi et al., 2007). The higher someone scores on this quotient, the stronger his drive to systemize the world around him. Those with high functioning autism or Asperger's syndrome have elevated scores on the Systemizing Quotient when compared with those of the normal population. Researchers that looked at empathizing and systemizing in adults with and without an ASD found consistent results (Wakabayashi et al., 2007). Participants consisted of neurotypicals and people on the spectrum that were either male or female. After taking the SQ, it was found that people with an ASD scored significantly higher than the neurotypical males and females (Wakabayashi et al., 2007). These results speak to the empathizing-systemizing theory, in which it states that people on the spectrum systemize at a higher level than neurotypicals.

Studies also use the Empathizing Quotient (EQ) to determine this distinct difference between people on the spectrum and the general population. The EQ measures a person's cognitive and affective empathy. Contrary to the SQ, those on the spectrum score lower on this scale when compared to neurotypical groups. The previously mentioned study on empathizing and systemizing in both people with an ASD and neurotypicals noted a significantly lower score on the EQ for people on the spectrum than people in the control groups (neurotypicals) (Wakabayashi et al., 2007). These low scores in empathizing help to explain the social and communication deficiencies that people on the spectrum display (Baron-Cohen, 2011).

Many studies using the SQ and EQ not only find differences between those with an ASD and neurotypicals, but also to find discrepancies between male and female neurotypicals (Lawson et al., 2004; Wakabayashi et al., 2007). Throughout studies, researchers have examined a difference in sex where neurotypical females score higher in empathizing and neurotypical males higher in systemizing (Lawson et al, 2004; Wakabayashi et al., 2007). Results from the previously mentioned Wakabayashi study showed a difference in sex with females scoring significantly higher than males on the EQ and males scoring significantly higher on the SQ (Wakabayashi et al., 2007). Researchers at Cambridge University had similar findings. Researchers used male and female neurotypicals and males with Asperger's syndrome as participants. After completing one empathizing task (Social Stories Questionnaire) and one systemizing task (The Physical Prediction Questionnaire) the researchers discovered found that while males with Asperger's performed worse than neurotypical males on the empathizing task, neurotypical males also scored significantly worse than neurotypical women. Researchers found a reverse in this trend for the systemizing task. Neurotypical females scored lower than neurotypical males on the Physical Prediction Questionnaire (systemizing task). However,

neurotypical males in turn scored worse than males with Asperger's syndrome (Lawson et al., 2004).

The sex differences found within the empathizing-systemizing theory suggests that female brains are more equipped for empathy and male brains are more equipped for constructing systems. Evidence also suggests the idea for this "type" of brain to be predetermined at birth (Focquart et al., 2007); the female brain is proposed to be predominantly hard-wired for empathy where as the male brain is predominantly hard-wired to understanding and building systems (Baron-Cohen, 2002, 2003; Baron-Cohen et al., 2005). These significantly high scores on systemizing for people on the spectrum can be explained by the Extreme Male Brain Theory, an extension of the E-Q theory. The Extreme Male Brain Theory shows that people with an ASD or Asperger's syndrome, who score very high on systemizing, can be seen as an extreme version of the typical male brain (Baron-Cohen, 2011). The E-S theory further explains these differences by breaking down the "types" of brains that are seen: Type E, Type S, Type B, Extreme Type E, and Extreme Type S. Type E consists of individuals whose empathy is greater than their systemizing, which is predicted for most neurotypical females. Type S is the opposite, consisting of people whose systemizing is stronger than their empathy; this brain type is predicted for most neurotypical males. Type B offers a balance between the two as it portrays individuals whose empathy and systemizing are equal. Extreme Type E consists of people whose empathy is above average but who are challenged when it comes to systemizing. Extreme Type S is the opposite containing individuals whose systemizing is above normal but who have difficulties with empathy; this type is considered to be where most people on the spectrum lie. These "brain types" further establish the sex difference in the E-Q theory as well as the high systemizing scores of people with an ASD. In the general population, over half of males (54%)

fit brain Type S, whereas a large percentage of females (44%) fit brain Type E. Furthermore, the majority of people with autism or Asperger's syndrome (65%) display an Extreme Type S brain (Baron-Cohen, 2011). These proportions speak to the sex differences and the Extreme Male Brain Theory seen in the E-Q Theory.

These brain types not only show to the sex differences in the E-Q theory, but also extend to the differences in science and humanities majors in college. Previous research displayed a significant difference between science and humanities majors on the Autism Spectrum Quotient (AQ) (Focquart et al., 2007). This quotient is a questionnaire whose results show the distinct differences in which people from the general population and the autistic population fall on the autism spectrum (Baron-Cohen, 2011). This research found that students in the sciences scored higher on the AQ than students in the humanities and social sciences (Focquart et al., 2007). More recent research further investigated this finding, suggesting that science students have Type S brains, and humanities and social science students have a Type E brain (Focquart et al., 2007). This assumption seems logical as students in science majors go into careers consisting of more systemizing tasks: engineers, scientists, doctors, etc. It also seems logical because humanities majors go into career fields that involve working with people, in which it is important to have empathy. The EQ and SQ were given to 351 college students in order to measure a participant's brain type. The results of this study show a student's major as well as their sex as highly significant. The sex difference that was found remained consistent with the sex difference in the E-Q theory; males as more systemizing and females as more empathizing. Results due to major were consistent with predictions. The researchers found that students in the sciences were more systemizing-driven and students in the humanities were more empathizing-driven (Focquart et al., 2007).

Another example of differences between sciences and humanities majors was found when researchers at Chiba University in Japan tested sex differences between children and adults in regards to social cognitive domain tasks and physical cognitive domain tasks (Wakabayashi et al., 2012). The social cognitive task can be seen as equivalent to an empathizing task; whereas the physical cognitive domain task can be seen as equivalent to a systemizing task. This study used the Eyes Test as the social cognitive domain task and the Intuitive Physics Test as the physical cognitive domain task. Participants were either college students or elementary school students. Although researchers found no significant sex difference on the Intuitive Physics Test, females in all age groups received significantly higher scores on the Eyes Test than males. These researchers also found consistent results with the E-Q theory, with males falling into the Type S brain and females falling into the Type E brain. This consistency strengthens the E-Q theory in reference to the sex difference between brain types. This study split also humanities and science majors into two groups. Due to this split, researchers found that humanities majors scored better on the Eyes Test and science majors scored greater on the Intuitive Physics Test (Wakabayashi et al., 2012). This difference between types of majors further speaks to the differences seen in the E-Q theory and the implications of this theory on a person's current and future education and career plans.

Age differences in participants allow us to look deeper into the E-Q theory and its implied idea that a person's brain type stems from birth (Focquart et al., 2007). Participants in the Chiba University study not only consisted of college students but of elementary school students as well (Wakabayashi et al., 2012). When these researchers looked at the youngest group of elementary school students, they found no significant sex difference between Type E and Type S cognitive styles (Wakabayashi et al., 2012). This finding or lack of finding may suggest

the development of this brain type over the period of a person's life. This finding might propose an impact of socialization on how a person's E-S type develops throughout life.

With the Wakabayashi et al. finding, an inconsistency in the research exists. Although it is proposed that a person's E-S type is instilled at birth (Focquart et al., 2007), this finding may suggest that this proposed idea is not entirely true. I suggest that socialization may have an impact on a person's E-S type. Socialization is defined as the process by which individuals acquire the knowledge, skills and dispositions that enable them to participate as more or less effective members of groups and the society (Joshi, 2001). Factors the current study will look at include parents, parenting styles, parental expectations, socioeconomic status (SES), siblings, sibling relationships, sex, and college majors. The following section explains how research provides background to how these socialization factors may affect a person's E-S type as he develops over time.

Socialization

The process of socialization occurs from infancy to adulthood as a person assimilates into society (Joshi, 2001). The personality psychology perspective on socialization notes the important role of parents during the socialization process. A parent's goals and a parent's means have a significant impact on a child's socialization (Joshi, 2001).

The personality psychology perspective on socialization suggests several ways in which a parent can influence his child's socialization (Joshi, 2001). This perspective states that if a parent comes under harsh domestic or economic conditions, a parent may alter his goals for his child. When this occurs, a parent changes his perspective from helping the child obtain realistic goals to focusing on teaching the child how to survive the same difficult conditions in which the parent

finds himself (Joshi, 2001). The influence of a parent's domestic and economic situations may suggest the impact of a child's socio-economic status on their socialization and possibly a child's E-S type.

Researchers at the University of Iowa looked into the influence of family socioeconomic status (SES) and a child's values on their future aspirations (Hitlin, 2006). Previous research links family socioeconomic status with a child's occupational aspirations. It also discusses the influence of family socioeconomic status on a child's values. This study looked to bridge these two ideas. Participants consisted of a cohort of college students whom the researchers followed from their first year to their fourth year of college. Researchers measured these participants' values, future career aspirations and socioeconomic statuses. A child's SES was seen to directly influence his aspirations. For example, a father's prestige score was positively correlated to his child's aspirations. A person's socioeconomic status was indirectly associated with a person's aspirations. For example, a father with a more nurturing job (in teaching or the field of medicine) influences a child to have fewer self-oriented values. These fewer self-oriented values may translate to a positive influence on the child's aspirations to have a nurturing job like his fathers. (Hitlin, 2006). If these factors influence one's career aspirations, then one can assume they may influence a student's choice of major in college. This choice of major, as seen in previous literature may be linked to a person's E-S type. In summary, these socialization factors of socioeconomic status and values that influence a child throughout development may also influence a person's E-S type.

Parenting styles can also be influenced by socioeconomic status (Hoff et al., 2002). Socioeconomic status affects parenting styles in the following ways: goals that parents set for their children, the emotional relationship parents establish with their children and the parenting

practices parents use with their children. Parents in various socioeconomic situations rear their children differently due to the diverse situations they find themselves in. Factors such as education, occupation, and financial factors all contribute to the variety of parenting styles with the factor of education having the greatest influence of all (Hoff et al., 2002).

Parents from higher SES groups expect their children to reach developmental milestones earlier in life than lower SES parents (Hoff et al., 2002). Parenting styles in higher SES groups are noted as more democratic when compared to the authoritarian parenting style seen in lower SES groups. In accordance with Baumrind's parenting styles, business class parents practice a more authoritative parenting style, where as working class parents use an authoritarian style. Parent-child relationships are also influenced by parenting styles and socioeconomic status. Parent-child relationships in middle class families are considered more accepting and egalitarian. However, these relationships with lower SES parents and children focus more on maintaining order and obedience (Hoff et al, 2002). These noted differences in parenting styles and parent-child relationships due to socioeconomic status help to imply a relationship between these variables, a child's socialization and their empathizing and systemizing traits.

Parents also affect their child's socialization with reinforcement through love as well as reinforcement through punishment (Joshi, 2001). When a parent withdraws his love from his child, or even threatens to do so, it has significant effects on a child's socialization (Joshi, 2001). This role of love and punishment may further propose an impact of various parenting styles on a child's socialization and possibly his empathizing and systemizing characteristics.

Parenting styles not only affect socialization, but directly influence a child's empathy. Undergraduate participants self-reported their antisocial behavior, empathy and their mother's and father's parenting styles (Schaffer et al., 2009). A result of these self-reports shows a

significant relationship between permissive parenting and empathy; permissive maternal parenting is linked to low empathy in young adulthood. The results of this study show the important influence that parenting styles play on a child's empathy through young adulthood (Schaffer et al., 2009). This effect of parenting styles on a child's empathy might be directly related to a child's empathizing score.

Parents also influence their children's empathy in other ways such as a mother's emotion socialization (Taylor et al., 2013). Practices of a mother's emotion socialization include expressive encouragement and emotion focused reactions. Expressive encouragement is defined as the degree to which parents encourage child to express emotion (i.e. a mother telling her child it is okay to cry when he falls and scrapes his knee). Emotion focused reactions reflect the degree to which parents respond with strategies that are designed to help the child feel better (i.e. A mother soothing her child when she is upset when being left alone at bedtime). When a parent discourages emotional expression, it results in a child having low empathy. Emotion focused reactions of the mother are positively correlated with a child's empathy over time (Taylor et al, 2013). These two relationships show the impact of the socialization factor of parenting on a child's empathy, and possibly his empathizing score.

Socialization includes other factors that may have an impact on a person's empathizing and systemizing traits over time. One of these factors is sibling relationships. Researchers looked into the influence of older siblings on younger siblings' empathy (Tucker et al., 1999). Older siblings are present in the everyday childhood of their younger siblings; these older siblings also act as companions. During these times spent together, older siblings may impact the empathy of their younger siblings. Although older siblings play similar roles to parent figures at times, they are considered a different type of role model for a younger child. Sibling pairs were looked at

during preadolescence and adolescence. Results found a link between the personal qualities of older siblings as well as their relationship with their younger siblings and the empathy of that younger sibling. Younger sisters were found to have greater empathy when their older siblings had great empathy. This suggests the idea that younger sisters see older siblings as more of a role model than younger brothers (Tucker et al, 1999). This socialization effect of older siblings may also explain part of a younger sibling's empathy score.

Current Study

This study looked to understand the link between socialization factors and empathizing-systemizing traits in neurotypicals. Although evidence suggests that an individual's E-S "brain type" is predetermined at birth, a discrepancy in the literature was found when the youngest group of participants did not display a sex difference between empathizing and systemizing (Focquart, 2007; Wakabayashi, 2012). Furthermore, several studies show how factors of socialization can significantly influence an individual's empathy, therefore possibly influencing a person's E-S scores. Parents can affect their child's empathy in various ways: parenting styles, emotion socialization, reinforcement through love and reinforcement through punishment (Hoff, 2002; Joshi, 2001; Schaffer, 2009; Taylor, 2013). Another familial socialization factor, older siblings, can also affect a younger sibling's empathy (Tucker et al, 1999).

The socialization factor of socioeconomic status has also been shown to indirectly affect a person's empathy, which may possibly translate to his EQ and SQ score. Different SES classes have been correlated with different parenting styles, which alter a child's empathy (Hoff, 2002; Schaffer, 2009). Socioeconomic status also influences a child's values and aspirations which may help to determine his major in college (Hitlin, 2006). This choice of major in college has been seen to be correlated with the person's brain type (Type E, Type S, etc.) (Focquart, 2007).

In full circle, the socialization factor of SES may be directly related to a person's empathizing and systemizing.

This study looked into the relationships between socialization factors (parents, parenting style, parental expectations, siblings, sibling relationships and SES) and a person's empathizing and systemizing scores. This study delved further into the discrepancies seen in literature of whether a person's brain type is predetermined at birth or whether it may be altered over time by various factors of socialization. During my research with college-aged neurotypicals I hoped to further develop the E-S theory by discovering how and what socialization factors may be related to a person's E-S type.

Research Question

Are socialization factors (especially parenting styles, parental expectations) related to a person's empathizing and systemizing cognitive traits? Do sex, siblings, sibling relationships, parents, and socioeconomic status also have relationships with these traits?

Hypotheses

H₁: Participants from low SES groups (whose parents more frequently use permissive or authoritarian parenting styles) will score lower on empathizing (EQ), than students from middle or high SES groups (whose parents more frequently use an authoritative parenting style).

H₂: Female participants will score higher on empathizing (EQ) and male participants will score higher on systemizing (SQ).

H₃: Participants with closer-warmer sibling relationships will correlate with having higher empathizing scores.

Methods

Participants

Undergraduate participants were recruited from various class years and departments at a small liberal arts college in Northwestern Pennsylvania.

Materials

Parental Authority Questionnaire (Buri, 1991) (Appendix A)

A thirty item questionnaire answered with a likert scale measuring the parenting style (authoritarian, authoritative, permissive) of a participant's parents (Buri, 1991). The likert scale consists of five points (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree). To score this questionnaire, add the individual items on each subscale (permissive style, authoritarian style, authoritative style) and total the subscale scores. The permissive style subscale is described as a relatively warm style that is non-demanding and non-controlling. The range for this subscale is 10-50. Higher scores reflect a more permissive parenting style. Authoritarian parenting is described as a style that values unquestioning obedience and an attempt to control the behavior of the child, often through punitive disciplinary practices. The range for this subscale is 10-50. The higher the score, the more an authoritarian style is reflected. Authoritative parenting is described as a style that is firm and clear in expectations, but flexible and rational in setting limits or making exceptions. The range for this subscale is 10-50, with higher scores displaying a more authoritative parenting style (Buri, 1991).

Parental Expectations Survey (self-designed) (Appendix B)

Twelve item questionnaire measuring the participants' observed expectations of themselves from their parents. Items are scored on a four point likert scale (SD=strongly disagree, D=disagree, A=agree, SA=strongly agree). This questionnaire measures individual educational and career expectations that parents of the participants may have for the participants. These individual expectations will be used to see if a correlation exists between parenting styles and certain expectations. It will also be used to see if certain parental expectations correspond to differences in empathizing (EQ) scores and systemizing (SQ) scores. This survey ended up not being used in this study because the researchers did not believe it fully capture parent's expectations of their children.

Hollingshead Index of Social Position (Hollingshead, 1975)

To assess SES using the Hollingshead Index of Social Position, the demographic form included questions asking participants their mother's and father's highest education attainment and occupation. From these responses, a score for socioeconomic status will be calculate with parent's education having a weight of three and parent's occupation having a weight of five. A higher score will indicate a higher SES, where as a lower score will indicate a lower SES.

Demographic Form (Appendix C)

This self-designed form will include straight forward questions such as sex, major, minor, whether they grew up in a home with a single parent or both parents, if they have siblings, the type of siblings they have, state they grew up in, and the area they grew up in (rural, suburban, urban).

Sibling Relationship Questionnaire (Furman and Buhrmester, 1985) (Appendix D)

Forty-eight item questionnaire uses self-report to assess the relationships with the closest-in-age siblings. The forty item questionnaire reveals four factors about sibling relationship. These factors include warmth/closeness (i.e. How much do you and your sister go places together and do things?), rivalry (i.e. How much do you and your sister compete with each other?), conflict (i.e. How much are you and your sister mean to each other?), and relative power. The power scale consists of two subscales: admiration and dominance. The admiration subscale consists of 6 items (i.e. How much do you admire and respect your sister?). The dominance subscale consists of three items in the questionnaire. Relative power is split into two subscales due to the fact that an individual's experience could be influenced by dominating over his sibling or by being dominated by that sibling. Responses to this 48 item questionnaire are scored on a likert scale (1=hardly at all to 5=extremely much) (Howe et al, 2010). A higher score in a relationship factor, the more that factor characterizes that sibling relationship. For this study, I will only be using the warmth-closeness scale and the relative power scale which totals to 33 questions.

Empathizing Quotient (EQ) (Appendix E)

Participants will complete the shortened version of the Empathizing Quotient (EQ) (Baron-Cohen, 2002). The EQ provides a score for an individual's empathizing: the drive to identify emotions and thoughts in others and to respond to these appropriately. The questionnaire consists of 22 questions. The items in this survey are randomized in order to avoid a response bias from the participant (Baron-Cohen & Wheelwright, 2004). An individual scores 2 points if he answers with a strong empathizing response. The individual only scores 1 point if he answers with a less strong empathizing response (Baron-Cohen & Wheelwright, 2004).

Systemizing Quotient (SQ) (Appendix F)

Participants will take the shortened version of the Systemizing Quotient (SQ) (Baron-Cohen et al, 2003). The SQ measures an individual's systemizing: the drive to analyze and build systems with the aim of understanding and predicting non-agentive events (Baron-Cohen, 2002). This questionnaire consists of 25 questions. The items in this survey are randomized in order to avoid a response bias from the participant (Baron-Cohen et al, 2003). An individual scores 2 points if he answers with a strong systemizing response. The individual only scores 1 point if he answers with a less strong systemizing response (Baron-Cohen et al, 2003).

Procedure

I conducted the implementation of this study on SONA – a participant management system. On SONA my study was titled “Family Life and Personality”. This title was used in order to keep participants from having participant bias while completing my measures. Participants were recruited from different departments and classes at Allegheny College. Participants either received course credit or were entered into a raffle for their participation. Upon starting my study on SONA, participants were asked to read an informed consent. They moved on to the next portions of the study only if they agreed to informed consent. At the end all participants were presented with a debriefing form. Participants completed all the surveys mentioned above in order to complete the study. Overall, participation in this research study was voluntary and took approximately 35 to 45 minutes.

Statistical Analysis

Using SPSS software, I analyzed the collected data in various ways. I computed the means, standard deviations and ranges of the following: Empathizing Quotient, Systemizing Quotient, and the Sibling Relationship Questionnaire subscales of Warmth and Power. One-way ANOVA's computed the differences of mean scores (F and p values) on the EQ, SQ, SRQ

(Warmth and Power) for the following groups: sex, class year, major area, hometown, siblings and parents. Lastly, correlations were run between the following variables: SES total, parent's education, parent's occupation, authoritarian parenting style, authoritative parenting style, permissive parenting style, EQ, SQ, and the SRQ subscales of Warmth and Power. r and p values were calculated for each correlation.

Results

Undergraduate students ($N=99$) from a small liberal arts college in Northwestern Pennsylvania participated in the Family Life and Personality Survey online via SONA. Participants were mostly made up of females ($n=82$) when compared to males ($n=17$) (Table 1). Participants mostly came from hometowns that were suburban ($n=61$) compared to rural ($n=26$) and city ($n=12$) settings (Table 1). Participants mainly grew up in households with both parents ($n=85$) rather than of single parent households ($n=14$) (Table 1). The average empathizing score ($M=25.27$) for all participants was greater than the mean score for systemizing ($M=17.89$) (Table 1).

One- way ANOVA's were completed to compare sexes, class years, major areas, hometown settings, siblings and parents by mean scores on the EQ, SQ, and subscales of SRQ (warmth and power). It is important to note that in ANOVA's involving warmth and power of sibling relationships, only children ($n=12$) were excluded as they do not have any sibling relationships. A one-way ANOVA was run to compare the effect of sex on one's empathizing score for males and females. There was a significant effect of sex on empathizing scores, with females ($M=26.10$, $SD=8.3$) scoring significantly higher than males ($M=21.29$, $SD=8.6$) [$F(1, 97)=4.64$, $p=0.03$] (Table 2). A one-way ANOVA was completed to show a significant effect of sex on systemizing scores, with male participants ($M=25.06$, $SD=7.1$) scoring higher than female participants ($M=16.40$, $SD=7.3$) [$F(1, 97)=19.91$, $p<0.001$] (Table 2). A one-way ANOVA

looked at the effect of sex on warmth in one's sibling relationships. This ANOVA showed a significant effect of sex on warmth, with females ($M=75.60$, $SD=15.2$) scoring higher than males ($M=62.33$, $SD=20.7$) [$F(1,85)=8.27$, $p=0.005$] (Table 2). It is also important to note the difference between male ($M=30.53$, $SD=10.1$) and female ($M=34.54$, $SD=6.6$) power scores in sibling relationships, as this difference was almost considered significant [$F(1, 85)=3.78$, $p=0.06$] (Table 2).

A one-way ANOVA was conducted to compare the effect of class year on systemizing scores for first years, sophomores, juniors and seniors [$F(3, 95)=3.03$, $p=0.03$] (Table 2). A Tukey post-hoc test found that seniors ($M=22.43$, $SD=9.5$) scored significantly higher than sophomores ($M=15.79$, $SD=7.3$) ($p=0.05$) (Table 2). A one-way ANOVA was completed to determine that major area had a significant effect on systemizing scores for natural science, humanities, social science, inter-divisional and double majors [$F(4, 94)=3.12$, $p=0.02$] (Table 2). A Tukey post-hoc test was conducted to find significant differences between natural science ($M=20.97$, $SD=8.6$) and humanities ($M=14.27$, $SD=4.8$) majors ($p=0.04$) (Table 2). This post-hoc test also found a significant difference between natural science ($M=20.97$, $SD=8.6$) and social science ($M=15.70$, $SD=7.9$) majors ($p=0.05$) (Table 2). A one-way ANOVA was completed to determine whether single parent or dual parent households had an effect on power in sibling relationships, which was found to be significant [$F(1, 85)=9.22$, $p=0.003$] (Table 2). Participants from dual parent ($M=27.82$, $SD=10.6$) households were found to have significantly greater power in sibling relationships than participants from single parent ($M=34.72$, $SD=6.4$) households (Table 2).

A variety of Pearson correlations were computed to assess the relationships between socioeconomic variables, parenting styles, EQ, SQ, and Sibling Relationship Questionnaire

variables. When computing SES, 11 participants did not make their parent's occupations clear, making the researcher unable to correctly compute these participant's total SES score. For these 11 participants, the average score of 96 was used for their SES total. These 11 participants were excluded from correlations in which occupation was a factor because the occupation score could not accurately be computed due to the lack of information provided by the participant. The 12 participants that were only children were excluded from any correlations in which the measures of warmth and power were computed. Again, these participants have scores of zero, because they do not have any sibling relationships.

Multiple Pearson correlations were computed in regards to different factors of socioeconomic status (total score, parent's education, and parent's occupations). A Pearson correlation computed for the variables of education and occupation found a positively significant relationship ($r=.47$, $n=88$, $p<0.001$) (Table 3). A second statistically significant correlation was found between the factors of total socioeconomic status score and occupation ($r=0.97$, $n=88$, $p<0.001$) (Table 3). Lastly, a third Pearson correlation found a significant correlation between education and total socioeconomic status score ($r=0.62$, $n=99$, $p<0.001$) (Table 3).

Several Pearson correlations looked at relationships between parenting styles and the various other measures found in Table 3. A Pearson correlation was computed that found a negative relationship between authoritarian parenting style and parent's education ($r=-0.25$, $n=99$, $p=0.02$) (Table 3). Another Pearson correlation found a positive relationship between authoritative parenting style and socioeconomic status ($r=0.20$, $n=99$, $p<0.001$) (Table 3). A positive correlation was also found between authoritative parenting style and parent's education ($r=0.20$, $n=99$, $p=0.04$) (Table 3). A Pearson correlation was also completed to determine the relationship between authoritative parenting style and authoritarian parenting style. This

correlation found a negative relationship between these two variables ($r=-0.56$, $n=99$, $p<0.001$) (Table 3). An additional Pearson correlation was computed between permissive parenting style and authoritarian parenting style to find a significantly negative relationship ($r=-0.62$, $n=99$, $p<0.001$) (Table 3). A last correlation was computed including parenting styles that looked at the relationship between permissive and authoritative parenting styles. The results determined that a significant positive correlation exists between these two variables ($r=0.29$, $n=99$, $p<0.001$) (Table 3).

Correlations were also computed in regards to warmth and power in sibling relationships and the other measures listed in Table 3. A Pearson correlation between warmth and authoritative parenting style was found to have a significantly positive relationship ($r=0.35$, $n=87$, $p=0.001$) (Table 3). A one-tailed correlation was computed to find a positive and significant relationship between empathizing and warmth ($r=0.23$, $n=87$, $p=0.02$) (Table 3). Another Pearson correlation was computed to find a positively significant correlation between the factors of power and authoritative parenting style ($r=0.21$, $n=87$, $p=0.05$) (Table 3). Lastly, a correlation between power and warmth was completed to find a positively significant correlation ($r=0.58$, $n=87$, $p<0.001$) (Table 3).

It is pertinent to note that several correlations were computed as one-tailed correlations, while the rest were computed as two-tailed correlations. A one-tailed correlation was computed between a participant's empathizing score and his permissive parenting score, because it was hypothesized that participants who were subject to more permissive parenting would have a lower empathizing score. Another correlation that looked at the relationship between empathizing score and warmth was computed as a one tail correlation; the researcher hypothesized that greater warmth in sibling relationships would correspond to greater

empathizing scores. A last correlation that was computed in a one tail fashion looked into the relationship between socioeconomic status and permissive parenting style. It was hypothesized that participants from lower SES backgrounds would experience greater permissive parenting.

When calculating the participant's parental occupations sub score and total SES score using Hollinghead's Index of Social Position, it was noticed that six participants answered that their parents were self-employed, entrepreneurs, or were home employed. Hollingshead Index of Social Position did not have scores to use for these occupations (Hollingshead, 1975). To calculate these participants' parental occupation and total SES scores, I used an article that found the mean income earnings of self-employed and entrepreneur males and females (Fairlie, 2005). I used these mean incomes to decide what number of score to give these participants when calculating their parental occupation score and total SES score.

Lastly, the Parental Expectations self-designed survey was not used as a factor in the results section of this research study like initially expected. After much thought, it was realized that comparing one individual measure of parental expectations (i.e. Your parents hoped that you would continue your education after high school) with a participant's parenting styles, EQ, and SQ scores would not fully capture parent's expectations of a participant. Parental expectations were also not included in the hypotheses in this project. Since the questions in this survey would not accurately represent parent's expectations in conjunction with a participant's parenting styles, EQ, and SQ scores, the researchers concluded it should be omitted from the results of this project.

Discussion

This study looked into how factors of socialization (parenting styles, SES, sibling relationships, types of siblings, and sex) were related to a participant's empathizing and

systemizing scores on the EQ and SQ in a college-aged population. Participants (N=99) were undergraduate students from various class years and departments at a small liberal arts college in Northwestern Pennsylvania. This study also looked to reconfirm results of differences between male and female participants in regards to empathizing and systemizing.

The overall research question of socialization factors affecting participants' EQ and SQ scores was supported for a couple of factors of socialization, but not for other factors of socialization that were researched. A positive correlation was found between EQ and warmth in sibling relationships (Table 3). The hypothesis of participants with warmer sibling relationships having greater empathizing scores was confirmed. Lam et al. used warmth and conflict subscales from the Sibling Relationship Inventory (Stocker and McHale, 1992) and a subset of questions from the Index of Empathy for Children and Adolescents (Bryant, 1982) to find that the association between sibling relationship warmth and empathy of the participant became stronger over the duration of their study (2012). These results support the result of the current study in which a positive correlation was found between the strength of sibling relationship warmth and a participant's EQ score. These results help to support the idea that socialization factors, such as sibling relationships can affect a person's empathy while growing up.

Differences were also found between males and females in regards to both empathizing and systemizing scores (Table 2). Males scored significantly higher than females on the SQ and females scored significantly higher than males on the EQ. These results support the hypothesis of this study which states females will score higher on the EQ and males will score higher on the SQ. These findings also support the findings of Lawson et al., who found that neurotypical females scored significantly higher than neurotypical males on a task of empathizing, where as neurotypical males score significantly higher than the neurotypical females on a systemizing task

(2004). Baron-Cohen further investigated this to find that females scored higher on the EQ than males, and that males scored higher on the SQ than females (2011). The results from the current study further verify the differences between neurotypical males and females regarding empathizing and systemizing scores.

Other factors of socialization were not found to have a significant effect on participants' EQ and SQ scores. For example, SES total score (made up of parents' education and parents' occupation scores) was not found to have a significant association with participants' EQ or SQ scores. It was hypothesized that participants' from lower SES backgrounds would have lower EQ scores than participants from higher SES backgrounds, which would result in a positive correlation between SES and EQ score. Although researchers like Jolliffe and Farington found a positive relationship between SES and empathy in adolescents, the current study did not (2006). This could be due to the population of participants that this study focused on. Participants were enrolled in a small liberal arts college whose tuition for the 2015-2016 school year will total \$54,742 (Fees/Charges 2015-2016, 2015). This information may suggest that a majority of participants come from a higher SES background. The results verified this with a mean SES score of 94.54. The results also showed a maximum of 113 and a minimum of 18 resulting in a range of 114 for total SES score. This relatively high average ($M=94.54$) compared with the maximum and minimum scores may suggest that this study did not include enough participants from lower SES backgrounds to find a significant result between SES and EQ.

A relationship between different parenting styles and EQ and SQ was also not found to be significant. It was hypothesized in relation to SES, that people who came from lower SES backgrounds (whose parents more likely use a permissive or authoritarian style) will score lower on the EQ than participants from higher SES backgrounds (whose parents more likely use an

authoritative style). Hoff and other his researchers indicated that when using Baumrind's parenting styles, working class parents tend to practice a more authoritarian parenting style, where as business class parents use a more authoritative style (2002). Furthermore, where as Schaffer et al. found that permissive maternal parenting was linked to lower empathy, a significant relationship was not found here (2009). None of these relationships were found in this study's results; this again could be due to the demographic information of the participants. Mentioned previously was the fact that the average mean SES score indicated an overall higher SES background. These parents would more likely use authoritative parenting styles. In fact the averages of the different parenting styles suggest this. The mean of permissive parenting was 25.56, the mean of authoritarian parenting was 30.86, and the mean of authoritative parenting was 35.73. The scale for these individual parenting styles ranged from 10-50. These averages may imply that the parent's of the participants in this study more strongly used an authoritative parenting style than the other two styles. These results could hint at a reason as to why this study found no differences among parenting styles and EQ and SQ scores.

It is important to take note though that even though the relationships between EQ scores are not significant, permissive and authoritarian parenting both resulted in negative relationships with a participant's EQ score (Table 3). On the other hand, authoritative parenting had a positive correlation with EQ score (Table 3). Although these correlations are not significant, they are going in the directions that were hypothesized at the beginning of this current study. This could suggest further research needs to be done in order to see if parenting style does it fact have an impact on a person's empathizing score.

The current study also found some significant results that were not hypothesized or stated in the research question. For example, females scored significantly higher in sibling relationship

warmth than males (Table 2). This makes intuitive sense due to society's gender stereotypes and the result that females scored significantly higher than males on the EQ. However, several pieces of research on sibling warmth and closeness have not found a gender difference for warmth and closeness in sibling relationships (Lam et al., 2013; Saragosa, 1995). The findings of this study may be a result of the small number of male participants (N=17) compared to females participants (N=82). This relatively small amount of male participants may not accurately represent males' warmth in their sibling relationships.

An ANOVA found a significant difference between class years (first year, sophomore, junior, and senior) and their mean scores on the SQ (Table 2). Specifically, a difference was found between the sophomore class and the senior class. This fact could contribute to the idea that peoples' empathizing and systemizing traits are not innate when they are born, but rather develop over time. Several researchers have not found any sex difference between genders and empathizing and systemizing traits in elementary school and high school students, adding to this idea (Wakabayashi et al., 2012; Zeyer, 2010). However, it is not certain whether this difference between classes is due to innate or environmental factors. Future research could focus on whether the factor of education affects one's systemizing score; in this case, students with more education (college seniors) having greater systemizing scores than younger students.

Area of education (i.e. major) was also found to differ among participant's SQ scores. Natural science majors had a significantly greater score on the SQ than both humanities and social science majors (Table 2). This confirms previous research stating that science majors were more systematic than humanities majors (Manson and Winterbottom, 2012; Wakabayashi et al., 2012). This finding also sheds light on the differences between social science and natural science majors.

One last difference was found between groups on the scale of power in sibling relationships. A significant difference was found between participants from single parent household and dual parent households, with participants from dual parent households having greater power in their sibling relationships than participants from single parent homes (Table 2). Research states that siblings from single mother homes adaptively develop a close and supportive bond to compensate for or to manage with parental divorce or the absence of their father (East and Khoo, 2005). Due to this close and nurturing bond between siblings of single parent households, siblings may not want to disrupt this bond by creating a power differential between them and their siblings. On the other hand, siblings from two parent households, may not experience this adaptive bond and feel comfortable placing a power differential between themselves and their sibling. It is also important to note that 11 participants came from single parent households, which may not accurately represent sibling relationships among all single parent homes

A handful of significant correlations were also found in the results of the current study. Positive correlations were found between total SES score, parents' education score, total SES score and parents' occupation score, and parents' education score coupled with parents' occupation score (Table 3). The positive relationships between total SES and the subscores of education and occupation confirm that the total SES score was influenced by the level of education received by the parents and the prestige of the parents' occupation; with a higher education level and a more prestigious occupation leading to a higher total SES score.

Several parenting styles also had significant relationships with factors of SES. Authoritarian parenting style was found to have a negative relationship with the education of one's parents (Table 3). Since education is a factor influences one's SES, this result reinforces

the research stating that working class parents practice a more authoritarian style than business class parents (Hoff et al., 2002). On the flip side, authoritative parenting was significantly and positively correlated with a participant's total SES score and parents' education, reinforcing the idea that business class parents use a more authoritative style of parenting (Table 3) (Hoff et al., 2002).

Parenting styles were found to have relationships among one another. A significantly negative relationship was found between authoritative parenting and authoritarian parenting (Table 3). This could be explained by understanding Baumrind's three parenting styles. Authoritarian parenting emphasizes blind obedience, whereas authoritative parenting expects children to meet specific behavioral standards, while also encouraging children to develop a sense of autonomy (Baumrind, 1966). The current study also discovered a significantly negative correlation between permissive and authoritarian parenting styles (Table 3). This result can be explained by the fact that authoritarian parenting is considered controlling whereas permissive parents make few demands of their children (Baumrind, 1966). Baumrind's characteristics of these parenting styles help to explain the negative difference found between authoritarian and permissive parenting styles. Lastly, a significantly positive relationship was found between permissive parenting and authoritative parenting (Table 3). Although permissive parents are reluctant to reinforce rules unlike authoritative parents, permissive and authoritative parents are both responsive and warm towards their children (Baumrind, 1966). These overlapping characteristics help to explain the positive correlation found between permissive parenting and authoritative parenting.

Research by Milevsky et al. found that an authoritative parenting style was associated with sibling closeness (2011). A positive relationship between warmth in sibling relationships

and authoritative parenting style found in the current study confirms this previous research. It is essential to note that the factor of warmth in sibling relationships (in the current study) encompassed the closeness between the siblings as well. The characteristics of authoritative parenting, combining warmth and nurturing with rationale and reasonable control, results in children who are emotionally healthy and socially skilled (Baumrind, 1966). These characteristics foster healthy outcomes in children that could help to explain the relationship between warmth/closeness in sibling relationships and authoritative parenting.

Another factor in sibling relationships, power, is referred to as the degree and direction of asymmetry in the relationship among siblings (Furman and Buhrmester, 1985). In the current study a positive correlation was found between power in sibling relationships and the authoritative parenting style (Table 3). Although, previous research was not found linking these two factors, the outcomes of children who are parented authoritatively can suggest an explanation for this relationship. Children who are parented authoritatively tend to be emotionally healthy and have developed social skills, as well as confidence in their ability to accomplish different tasks (Baumrind, 1966). These three outcomes combined may foster children who feel confident and are emotionally prepared to act as a role model to a younger sibling or a sibling with a disability, thus creating a power differential between the siblings. If one is to understand both warmth and power in sibling relationships and their associations to authoritative parenting, one may suggest that the factors of warmth and power also be related. The current study in fact found a significant positive relationship between power and warmth in sibling relationships. This relationship suggests that siblings who have closer and warmer relationships also have a difference in power between each other. One could hypothesize that one sibling acts as a role model or influential figure towards the other sibling.

Strengths

This current research focused on a novel topic of understanding the relationships between socialization factors and empathizing and systemizing scores. Its objective was to shed light on the importance of the environment on EQ and SQ scores of neurotypical males and females. This research looked at multiple factors in the environment to understand this relationship; it looked at standardized SES scores, siblings, sibling relationships, parents, and parenting styles. The current study was also able to reach out to a broader population of undergraduate students than just students in the psychology department because participants completed the survey online. This allowed the study to have a fairly large sample size (N=99). This study verified significant results seen in previous research, as well as found some new significant relationships.

Limitations

This study faced a few limitations during the research process. Since the survey was taken online, the researcher could not control the environment the participants were in when they completed the survey. A bigger sample would have also been a benefit to the current research, allowing for a wider variety of participants; like mentioned previously, participants from the small liberal arts college, according to the SES results, seemed to be from middle to high SES backgrounds, limiting the diversity of this study. Lastly, this study only looked at three of the four parenting styles. It did not look into the uninvolved parenting style, which could provide a more thorough investigation of parenting styles' relationships with empathizing and systemizing traits.

Future Directions

Future research could look into the fourth parenting style, uninvolved, to capture more thorough relationships between parenting styles and EQ and SQ scores. It would also be interesting to look at other factors of sibling relationships measured in the full Sibling Relationship Questionnaire in order to see if these other factors play a role in one's EQ and SQ scores. Although this study asked participants what kind of siblings they participant had, it did not ask participants where they were in the birth order of their siblings (oldest, middle, youngest). Looking into birth order could further provide information as to how one's environment may influence their EQ and SQ scores. Results from this study showed that seniors were more systematic than sophomores. Future research could investigate whether education level has an impact on one's systemizing score. Lastly, future research could look into exactly how and why participants from dual parent households have greater power in sibling relationships than their peers from single parent households.

Conclusion

The current research sheds light on how environmental factors may influence a neurotypical's systemizing or empathizing scores. It also confirmed previous research regarding differences in males and females, and differences in majors in regards to the EQ and SQ. The relationship between sibling relationship warmth/closeness and one's empathizing score, gives researchers a glimpse into the fact that these relationships while growing up may impact one's empathizing score. Furthermore, the difference between seniors' and sophomores' systemizing scores, brings about a novel hypothesis that one's education may impact his or her systemizing score; with more education causing a person to become more systemizing. These results indicate that one's environment may factor into their empathizing and systemizing scores and that these traits may not just be innate at birth (Focquart et al., 2007). Future research needs to investigate

the relationships between different factors of the environment and one's empathizing and systemizing scores.

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Table 1. Summary of Participant Demographic Information and Scales

	N (%)	Mean (SD)	Range
Sex			
Male	17 (17.2%)	-	-
Female	82 (82.8%)	-	-
Class Year			
First Year	38 (38.4%)	-	-
Sophomore	24 (24.2%)	-	-
Junior	23 (23.2%)	-	-
Senior	14 (14.1%)	-	-
Major Area			
Natural Science	37 (37.4%)	-	-
Humanities	15 (15.2%)	-	-
Social Science	30 (30.3%)	-	-
Inter-divisional	6 (6.1%)	-	-
Double Major	11 (11.1%)	-	-
Hometown			
Rural	26 (26.3%)	-	-
City	12 (12.1%)	-	-
Suburban	61 (61.6%)	-	-
Siblings			
Only child	12 (12.1%)	-	-
One sister	25 (25.3%)	-	-
One brother	20 (20.2%)	-	-
Equal number of sisters and brothers	18 (18.2%)	-	-
More sisters than brothers	9 (9.1%)	-	-
More brothers than sisters	15 (15.2%)	-	-
Parents			
Single Parent	14 (14.1%)	-	-
Both Parents	85 (85.9%)	-	-
Empathizing Quotient	-	25.27 (8.48)	38
Systemizing Quotient	-	17.89 (7.91)	47
Sibling Relationship Questionnaire			
Warmth	-	73.31 (16.93)	82
Power	-	33.85 (7.38)	41

Table 2. Differences in Means for Empathizing, Systemizing, Warmth and Power based on categorical variables

	n	EQ	SQ	SRQ ^a Warmth	SQR ^a Power
Sex					
Male	17	21.29 (8.6)	25.06 (7.2)	62.33 (20.8)	30.53 (10.1)
Female	82	26.10 (8.3)	16.40 (7.3)	75.60 (15.2)	34.54 (6.6)
F (p)		4.64 (0.03)	19.91(<0.001)	8.27 (0.005)	3.78 (0.06)
Class Year					
First Year	38	25.24 (9.0)	16.47 (7.3)	76.46 (14.3)	35.37 (5.9)
Sophomore	24	26.63 (7.8)	15.79 (7.3)	67.00 (21.3)	33.00 (9.9)
Junior	23	24.04 (6.8)	19.65 (7.8)	71.47 (12.2)	32.68 (5.0)
Senior	14	25.07 (11.2)	22.43 (9.5)	78.08 (19.9)	32.75 (9.4)
F (p)		0.36 (0.78)	3.03 (0.03)^b	1.82 (0.15)	0.83 (0.48)
Major Area					
Natural Science	37	23.68 (7.2)	20.97 (8.6)	72.32 (15.5)	33.26 (7.0)
Humanities	15	25.07 (7.6)	14.27 (4.8)	73.79 (11.0)	34.14 (7.1)
Social Science	30	26.83 (10.5)	15.70 (7.9)	74.81 (19.2)	34.93 (8.0)
Inter-divisional	6	26.33 (8.1)	16.33 (4.9)	67.80 (26.7)	32.20 (12.1)
Double Major	11	26.09 (8.4)	19.27 (7.2)	74.40 (18.6)	33.20 (5.1)
F (p)		0.62 (0.65)	3.12 (0.02)^c	0.22 (0.93)	0.27 (0.90)
Hometown					
Rural	26	25.08 (8.1)	16.92 (6.5)	74.60 (18.70)	34.12 (8.8)
City	12	27.83 (7.4)	15.50 (7.2)	71.70 (15.7)	34.60 (4.8)
Suburban	61	24.85 (8.9)	18.77 (8.6)	73.00 (16.5)	33.58 (7.1)
F (p)		0.62 (0.54)	1.11 (0.33)	0.12 (0.88)	0.10 (0.90)
Siblings					
Only child	12	25.33 (9.1)	18.50 (6.3)	-	-
One sister	25	25.32 (8.0)	16.60 (7.5)	73.32 (17.1)	35.00 (6.9)
One brother	20	26.35 (10.7)	18.45 (7.7)	67.50 (18.6)	30.65 (7.9)
Equal number of	18	23.44 (7.8)	18.78 (7.2)	71.44 (19.4)	33.22 (8.7)
sisters and brothers					
More sisters than	9	26.78 (5.9)	17.44 (8.0)	84.78 (5.7)	37.00 (5.8)
brothers					
More brothers	15	25.00 (8.9)	18.00 (11.4)	78.07 (12.3)	35.07 (5.7)
than sisters					
F (p)		0.28 (0.92)	0.21 (0.96)	2.10 (0.09)	1.69 (0.16)
Parents					
Single Parent	14	23.14 (6.1)	16.21 (8.8)	68.64 (23.5)	27.82 (10.6)
Both Parents	85	25.62 (8.8)	18.16 (7.8)	73.99 (15.8)	34.72 (6.4)
F (p)		1.02 (0.32)	0.72 (0.40)	0.96 (0.33)	9.22(0.003)

^a Sibling Relationship Questionnaire^b A Tukey post-hoc test determined that seniors scored significantly higher than sophomores on the SQ.^c A Tukey post-hoc test determined that natural science majors scored significantly higher than both humanities and social science majors on the SQ.

Table 3. Correlations between Socioeconomic Status Measures, Parenting Styles, Empathizing Scores, Systemizing Scores and Sibling Relationship Measures.

	1	2	3	4	5	6	7	8	9
SES									
1. Total	-								
2. Education	0.62**	-							
3. Occupation	0.97**	0.47**	-						
Parenting Styles									
4. Authoritarian	-0.10	-0.25*	0.04	-					
5. Authoritative	0.20*	0.20*	0.13	-0.56**	-				
6. Permissive	-0.02	-0.03	-0.09	-0.62**	0.29**	-			
7. EQ	-0.05	-0.10	-0.05	-0.02	0.15	-0.14	-		
8. SQ	0.11	0.13	0.10	-0.12	0.12	0.07	-0.15	-	
SRQ ^a									
9. Warmth	0.02	0.03	0.04	-0.15	0.35**	0.01	0.23*	0.13	-
10. Power	0.03	-0.02	0.01	-0.07	0.21*	0.07	0.14	0.12	0.58**

* $p < 0.05$ ** $p < 0.001$ ^aSibling Relationship Questionnaire

Appendix A
Parental Authority Questionnaire

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Instructions: For each of the following statements, circle the number of the 5-point scale (1 = strongly disagree, 5 = strongly agree) that best describes how that statement applies to you and your caretaker(s). Try to read and think about each statement as it applies to you and your caretaker(s) during your years of growing up at home. There are no right or wrong answers, so don't spend a lot of time on any one item. Be sure not to omit any items.

If your caretaker(s) were separated or divorced before you reached age 12, think about the caretaker with whom you spent the most time when you answer the questions.

1 = Strongly disagree

2 = Disagree

3 = Neither agree nor disagree

4 = Agree

5 = Strongly agree

___ 1. While I was growing up my caretaker(s) felt that in a well-run home the children should have their way in the family as often as the caretaker(s) do.

___ 2. Even if their children didn't agree with them, my caretaker(s) felt that it was for our own good if we were forced to conform to what they thought was right.

___ 3. Whenever my caretaker(s) told me to do something as I was growing up, they expected me to do it immediately without asking any questions.

___ 4. As I was growing up, once family policy had been established, my caretaker(s) discussed the reasoning behind the policy with the children in the family.

___ 5. My caretaker(s) have always encouraged verbal give-and-take whenever I have felt that family rules and restrictions were unreasonable.

___ 6. My caretaker(s) has always felt that what children need is to be free to make up their own minds and to do what they want to do, even if this does not agree with what their caretaker(s) might want.

___ 7. As I was growing up my caretaker(s) did not allow me to question any decision they had made.

___ 8. As I was growing up my caretaker(s) directed the activities and decisions of the children in the family through reasoning and discipline.

___ 9. My caretaker(s) have always felt that more force should be used by caretaker(s) in order to get their children to behave the way they are supposed to.

____10. As I was growing up my caretaker(s) did not feel that I needed to obey rules and regulations of behavior simply because someone in authority had established them.

____11. As I was growing up I knew what my caretaker(s) expected of me in my family, but I also felt free to discuss those expectations with my caretaker(s) when I felt that they were unreasonable.

____12. My caretaker(s) felt that wise caretaker(s) should teach their children early just who is boss in the family.

____13. As I was growing up, my caretaker(s) seldom gave me expectations and guidelines for my behavior.

____14. Most of the time as I was growing up my caretaker(s) did what the children in the family wanted when making family decisions.

____15. As the children in my family were growing up, my caretaker(s) consistently gave us direction and guidance in rational and objective ways.

____16. As I was growing up my caretaker(s) would get very upset if I tried to disagree with them.

____17. My caretaker(s) feel that most problems in society would be solved if caretaker(s) would not restrict their children's activities, decisions, and desires as they are growing up.

____18. As I was growing up my caretaker(s) let me know what behavior they expected of me, and if I didn't meet those expectations, they punished me.

____19. As I was growing up my caretaker(s) allowed me to decide most things for myself without a lot of direction from them.

____20. As I was growing up my caretaker(s) took the children's opinions into consideration when making family decisions but they would not decide something simply because the children wanted it.

____21. My caretaker(s) did not view themselves as responsible for directing and guiding my behavior as I was growing up.

____22. My caretaker(s) had clear standards of behavior for the children in our home as I was growing up, but they were willing to adjust those standards to the needs of each of the individual children in the family.

____23. My caretaker(s) gave me direction for my behavior and activities as I was growing up and she expected me to follow their direction, but they were always willing to listen to my concerns and to discuss that direction with me.

____24. As I was growing up my caretaker(s) allowed me to form my own point of view on family matters and they generally allowed me to decide for myself what I was going to do.

____25. My caretaker(s) have always felt that most problems in society would be solved if we could get caretaker(s) to strictly and forcibly deal with their children when they don't do what they are supposed to as they are growing up.

____26. As I was growing up my caretaker(s) often told me exactly what they wanted me to do and how they expected me to do it.

____27. As I was growing up my caretaker(s) gave me clear direction for my behaviors and activities, but they were also understanding when I disagreed with them.

____28. As I was growing up my caretaker(s) did not direct the behaviors, activities, and desires of the children in the family.

____29. As I was growing up I knew what my caretaker(s) expected of me in the family and they insisted that I conform to those expectations simply out of respect for their authority.

____30. As I was growing up, if my caretaker(s) made a decision in the family that hurt me, they were willing to discuss that decision with me and to admit it if they had made a mistake.

Scoring

Add the individual items on each subscale and total the subscale scores

Subscale #1: Permissive Parenting Style

Add scores for numbers 1, 6, 10, 13, 14, 17, 19, 21, 24, 28

Subscale #2: Authoritarian Parenting Style

Add scores for numbers 2, 3, 7, 9, 12, 16, 18, 25, 26, 29

Subscale #3: Authoritative Parenting Style

Add scores for numbers 4, 5, 8, 11, 15, 20, 22, 23, 27, 30

Appendix B
Parental Expectations Survey

Parental Expectations Survey	SD	D	A	SA
1. Your parents hoped that you would continue your education after high school				
2. Your parents dream of you obtaining an advanced degree (MA, MD, PhD).				
3. Your parents' educational expectations for you influence your own educational goals.				
4. Your parents encouraged/are encouraging you to obtain a degree/career in the sciences (social, natural).				
5. Your parents encouraged you/are encouraging you to obtain a degree/career in the humanities.				
6. Your parents hold the same educational goals for you as they did for themselves.				
7. Your parents' opinions influence the decisions you make on which courses to take.				
8. Your parents had an influence on your college decision.				
9. Your college major/minor was influenced by your parents' opinions.				
10. Your parents believed that you should go to college only if you wanted to.				
11. Your parents focus on the importance of learning, regardless of the grade you receive.				
12. You are aware of your parent's expectations for your education.				

SD: Strongly disagree

D: Disagree

A: Agree

SA: Strongly Agree

Appendix C Demographic Form

Sex: Male=1 Female=2 Other=3

Ethnicity: Caucasian=1 Hispanic=2 Asian American=3 African American=4

Class Year: First Year=1 Sophomore=2 Junior=3 Senior=4

Major: Natural Sciences=1 Humanities=2 Social Sciences=3 Inter-divisional Major=4
Double Major=5

Major(s):_____ (typed response)

Minor: _____ (typed response)

Siblings: Yes=1 No=2

What type of siblings do you have?

1=One sister 2=One brother 3=Equal number of brothers and sisters 4=More sisters than brothers 5=More brothers than sisters

What type of area did you live in while growing up?

Rural=1 City=2 Suburban=3

What state did you grow up in? _____ (typed response)

Which religion do you identify with most?

1=Christianity 2=Judaism 3=Islam 4=Hinduism 5=Buddhism 6=Agnostic
7=Atheist 8=Pagan/Wiccan 9=Other 10=No Preference

Did you grow up in a single parent home or with both parents until the end of high school?

1=Single parent 2=Both parents

What is your mother's highest education attainment level?

0=Not applicable 1=Less than 7th grade 2= Junior High School (9th Grade)
3=Partial High School (10th or 11th grade) 4=High School Graduate
5=Partial college at least 1 year 6=Standard college or university graduation
7=Graduate Professional Training

What is your father's highest education attainment level?

0=Not applicable 1=Less than 7th grade 2= Junior High School (9th Grade)
3=Partial High School (10th or 11th grade) 4=High School Graduate
5=Partial college at least 1 year 6=Standard college or university graduation
7=Graduate Professional Training

What is your father's occupation? _____ (typed response)

What is your mother's occupation? _____ (typed response)

Appendix D
Sibling Relationship Questionnaire

1. Some siblings do nice things for each other a lot, while other siblings do nice things for each other a little. How much do both you and this sibling do nice things for each other?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
3. How much do you show this sibling how to do things he or she doesn't know how to do?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
4. How much does this sibling show you how to do things you don't know how to do?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
5. How much do you tell this sibling what to do?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
6. How much does this sibling tell you what to do?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
8. Some siblings care about each other a lot while other siblings don't care about each other that much. How much do you and this sibling care about each other?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
9. How much do you and this sibling go places and do things together?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
11. How much do you and this sibling like the same things?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
12. How much do you and this sibling tell each other	Hardly at all	Not too much	Somewhat	Very much	Extremely much

everything?					
14. How much do you admire and respect this sibling?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
15. How much does this sibling admire and respect you?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
17. Some siblings cooperate a little. How much do you and this sibling cooperate with each other?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
19. How much do you help this sibling with things he or she can't do by him or herself?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
20. How much does this sibling help you with things you can't do by yourself?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
21. How much do you make this sibling do things?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
22. How much does this sibling make you do things?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
24. How much do you and this sibling love each other?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
25. Some siblings play around and have fun with each other a lot, while other siblings play around and have fun with each other a little. How much do you and this sibling play around and have fun with each other?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
27. How much do you and this sibling have in common?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
28. How much do	Hardly at	Not too	Somewhat	Very much	Extremely

you and this sibling share secrets and private feelings?	all	much			much
30. How much do you look up to and feel proud of this sibling?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
31. How much does this sibling look up to and feel proud of you?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
33. How much do both you and your sibling share with each other?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
35. How much do you teach this sibling things he or she doesn't know?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
36. How much does this sibling teach you things that you don't know?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
37. How much do you order this sibling around?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
38. How much does this sibling order you around?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
40. How much is there a strong feeling of affection (love) between you and this sibling?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
41. Some kids spent lots of time with their siblings, while other's don't spend so much. How much free time do you and this sibling spend together?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
43. How much are you and this sibling alike?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
44. How much do	Hardly at	Not too	Somewhat	Very much	Extremely

you and this sibling tell each other things you don't want other people to know?	all	much			much
46. How much do you think highly of this sibling?	Hardly at all	Not too much	Somewhat	Very much	Extremely much
47. How much does this sibling think highly of you?	Hardly at all	Not too much	Somewhat	Very much	Extremely much

Scoring

Warmth/closeness: Total items 1, 8, 9, 11, 12, 14, 15, 17, 24, 25, 27, 28, 30, 31, 33, 40, 41, 43, 44, 46, 47

Relative status/power: Total items 3, 4, 5, 6, 19, 20, 21, 22, 35, 36, 37, 38

Appendix E

Shortened Empathizing Quotient

1. I can easily tell if someone else wants to enter a conversation.
3. I really enjoy caring for other people.
4. I find it hard to know what to do in a social situation.
8. I often find it difficult to judge if something is rude or polite.
9. In a conversation, I tend to focus on my own thoughts rather than on what my listener might be thinking.
11. I can pick up quickly if someone says one thing but means another.
12. It is hard for me to see why some things upset people so much.
13. I find it easy to put myself in somebody else's shoes.
14. I am good at predicting how someone will feel.
15. I am quick to spot when someone in a group is feeling awkward or uncomfortable.
18. I can't always see why someone should have felt offended by a remark.
21. I don't tend to find social situations confusing.
22. Other people tell me I am good at understanding how they are feeling and what they are thinking.
26. I can easily tell if someone else is interested or bored with what I am saying.
28. Friends usually talk to me about their problems as they say that I am very understanding.
29. I can sense if I am intruding, even if the other person doesn't tell me.
31. Other people often say that I am insensitive, though I don't always see why.
34. I can tune into how someone else feels rapidly and intuitively.
35. I can easily work out what another person might want to talk about.
36. I can tell if someone is masking their true emotion.
38. I am good at predicting what someone will do.
39. I tend to get emotionally involved with a friend's problems.

Appendix F

Shortened Systemizing Quotient

3. If I were buying a car, I would want to obtain specific information about its engine capacity.
5. If there was a problem with the electrical wiring in my home, I'd be able to fix it myself.
6. I rarely read articles or web pages about new technology.
7. I do not enjoy games that involve a high degree of strategy.
8. I am fascinated by how machines work.
9. In math, I am intrigued by the rules and patterns governing numbers.
10. I find it difficult to understand instruction manuals for putting appliances together.
12. If I were buying a computer, I would want to know exact details about its hard disc drive capacity and processor speed.
14. I find it difficult to read and understand maps.
16. When I look at a piece of furniture, I do not notice the details of how it was constructed.
20. I find it difficult to learn my way around a new city.
21. I do not tend to watch science documentaries on television or read articles about science and nature.
22. If I were buying a stereo, I would want to know about its precise technical features.
23. I find it easy to grasp exactly how odds work in betting.
24. I am not very meticulous when I carry out D.I.Y.
25. When I look at a building, I am curious about the precise way it was constructed.
27. I find it difficult to understand information the bank sends me on different investment and saving systems.
28. When travelling by train, I often wonder exactly how the rail networks are coordinated.
30. If I were buying a camera, I would not look carefully into the quality of the lens.
32. When I hear the weather forecast, I am not very interested in the meteorological patterns.
33. When I look at a mountain, I think about how precisely it was formed.
34. I can easily visualize how the motorways in my region link up.
35. When I'm in a plane, I do not think about the aerodynamics.
37. I am interested in knowing the path a river takes from its source to the sea.
39. I am not interested in understanding how wireless communication works.