

Sibling Warmth, Coping, and Distress among Emerging-Adult Siblings of Individuals with  
and without Autism  
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## ABSTRACT

Sibling relationships have been proven to be influential to the well-being of emerging adults. However, the diversity of individuals, particularly in regard to siblings of individuals with disabilities, has rarely been examined. Therefore, the current study explored the association among sibling relationships, coping, and well-being of emerging adults who have non-disabled siblings or autistic siblings. A single online survey was distributed to people between 18-25 who have non-disabled siblings or autistic siblings. The results found that siblings of autistic individuals reported significantly less sibling warmth, less gratitude, and more emotion suppression than siblings of a non-disabled brother or sister. In addition, optimism, gratitude, and emotion suppression were mediators that affected how sibling warmth related to individual's distress. Furthermore, optimism and gratitude could be mediators that influenced the relationship between sibling warmth and individual's resilience. In conclusion, the current study proposed that the difference of coping styles may be the underlying mechanism of worse well-being of siblings, and more perceived sibling warmth may be a buffer for ASD-Sibs' resilience and coping.

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GENERAL AUDIENCE ABSTRACT

Sibling relationships can provide great supports for people during emerging adulthood (18-25 years old). The current study explored how sibling relationships affected emerging adults' distress. We recruited non-disabled individuals who had an autistic sibling or a non-disabled sibling, and distributed them into ASD-group and ND-group correspondingly. There were 26 participants in ASD-group and 73 participants in ND-group. We found that people who had autistic siblings reported less sibling warmth, gratitude attitude, and more emotion suppression compared to people who had non-disabled siblings. We also found that sibling warmth affected distress by influencing optimism, gratitude, and emotion suppression. In addition, sibling warmth affected individual's resilience by influencing optimism and gratitude. In conclusion, we proposed that for emerging adults who had an autistic sibling, clinical practitioners should focus more on their coping styles and their sibling relationships.

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## CHAPTER 1: INTRODUCTION

### Sibling Relationships

Sibling relationships are the most influential, essential, and the longest lasting relationships in many peoples' lives. Nearly 95% of adults in the United States have at least one sibling of some type (Crispell, 1996). Despite dramatic declines in family size in past decades in the US, demographic data reveals that the vast majority of children grow up in homes with at least one sibling (U.S. Census Bureau, 2008). Although the estimated time spent with siblings exceeds that with parents (Feinberg et al., 2012), the sibling relationship is an emerging and notable research topic only recently compared to the consistent attention to parent-child relationships. Thus, sibling researchers have numerous topics to explore based on the extended life course, while also taking into account demographic diversity. My master's thesis focused on people in the transition period to adulthood and compared their perception of relationship with non-disabled siblings or autistic siblings and how such perception impacts their life satisfaction and well-being.

There are several stages through which sibling relationships progress and develop from a life-cycle perspective. Goetting (1986) outlined the development tasks of siblingship in the United States into three stages, based on family systems theory and life course perspective. The first stage is childhood and adolescence, starting from the beginning of life to a sibling's teen years. He described siblingship in this period as more intense than later stages due to the dense daily contact with each other and the common resources they shared. Despite of that, it was also a period marked by intimacy and mutual influence. The second



stage is early and middle adulthood. He described this period as beginning when siblings no longer lived together with their parents and started to establish their own family. Sibling ties became loosened during this period but also provided essential emotional and financial support. However, Goetting also acknowledged that research on sibling relationships in adulthood was very limited, even compared with sibling research in childhood and adolescence. The last stage in the life cycle typically referred to the postretirement years. In this period, older adults indicated greater closeness and compatibility with their siblings when compared with younger stages. This tendency was still mediated by geographical distance, but the impact of marriage, parenthood, and economic roles was reduced in this period compared to early and middle adulthood.

In summary, studying sibling relationships from the life course perspective and paying attention to different stages can clarify the change and variations, thus improving the applicability of sibling research. However, the second stage defined by Goetting was based on life conditions in the 1980s in the United States; nowadays emerging adults have longer education experience and tend to get married and build families later than last century (Furstenberg et al., 2005). In terms of this global change, sibling relationships may function differently from what Goetting depicted in 1986. Additionally, the impact of unique challenges during transitions to adulthood is crucial. Mouw (2005) also proposed leaving home and completing education were important transitions to adulthood. Similarly, Cicirelli (1995, p.218) argued that “at present, the greatest gap in knowledge about the course of sibling relationships across the life span is in young adulthood” originating from the sibling

literature review. Therefore, sibling relationships during emerging adulthood should not be underrepresented in academia, application, or public.

An attractive argument suggested that even though warmth and rivalry were logically opposite, individuals' perception of them were minimally related (Dunn, 1983). These results not only highlighted the complexity of sibling relationships, but also reflected the ambivalent feelings many individuals felt toward their siblings (Stocker et al., 1997). A more recent study also attempted to integrate the benefits of sibling conflicts for adult well-being and competence (Bedford et al., 2000). This literature highlights the importance of exploring specified dimensions of sibling relationships in the lifespan. In the thesis, I paid particular attention to the warmth dimension of sibling relationships during emerging adulthood.

### **Siblings of Autistic Individuals**

**Autism Spectrum Disorder.** Based on the recent update to the Diagnostic and Statistical Manual (DSM-5; American Psychological Association 2013), ASD is defined by persistent deficits in social communication (e.g., reciprocity, nonverbal communicative behavior, developing relationships) and restricted or repetitive patterns of behavior, interests, or activities (e.g., insistence on sameness, stereotyped motor movements). ASD is mostly characterized by social, communication, and developmental impairment (Sicile-Kira, 2004).

A diagnosis of ASD now includes several conditions that used to be diagnosed separately: autistic disorder, pervasive developmental disorder not otherwise specified (PDD-NOS), and Asperger syndrome (Guthrie et al., 2013). The reason why autism is also named as “spectrum” is because there is a wide variety of phenotypes, such as different symptoms

combinations and severities within autistic people. Thus, the nature of ASD itself increases the difficulty of accurate diagnosis. Current diagnosis mainly based on behavioral tests by experienced psychiatrists, pediatricians, or psychologists.

According to the Centers for Disease Control and Prevention (2020), 1 in 54 children have been diagnosed with an autism spectrum disorder. ASD prevalence has gender differences, with a ratio of approximately 4.5 male:1 female with ASD during 2006–2012 (Wiggins et al., 2018).

Kapp et al. (2021) advocated researchers using identity-first language to better respect autistic people. Thus, in the current paper, we used “siblings of autistic individuals” instead of siblings of individuals with ASD.

**Siblings of autistic individuals.** A quote from a mother of an autistic boy stated, “My son does not have autism; my family has autism” (Medrano, 2013). This quote vividly describes the mutual influence within family systems and the extended influence of having a family member who was diagnosed with ASD. However, the evidence of how emerging adults who have autistic siblings adjust is still inadequate compared to research on mothers of autistic children (Orsmond & Seltzer, 2009).

Mixed results of how siblings of autistic people adjust have existed and require more clarifications from empirical and meta-analysis studies. Previous study proposed that ASD-Sibs have worse sibling relationships than comparison groups, but none of the studies explicitly measured emerging adults (Shivers et al., 2019). Additionally, most studies focused on behavioral challenges of ASD-Sibs and aimed to examine whether or not ASD-Sibs were

at risk of negative outcomes. Some scholars have found increased risk of poor psychological adjustment in children who have an autistic sibling; however, they also indicated the apparent variations that some siblings had no adjustment problems, whilst others had potentially significant difficulties (Hastings, 2003). On the contrary, other studies have found opposite results. Many suggested that siblings of autistic children to be more well-adjusted than are children with non-disabled siblings (Pilowsky et al., 2004). A meta-analysis conducted by Yirmiya et al. (2001) summarized previous results and concluded that there was insufficient data to support that ASD-Sibs were at higher risk for negative outcomes compared to ND-Sibs, but ASD-Sibs may have more negative psychiatric outcomes compared to siblings of individuals with Down Syndrome. A more recent meta-analysis conducted by Shivers et al. (2019) also indicated that ASD-Sibs have significantly more negative outcomes than comparison groups overall.

To conclude, previous studies showed the variations of behavioral challenges and psychological adjustment of siblings of autistic individuals and had the tendency to indicate small yet significant differences of adjustment between ASD-Sibs and ND-Sibs. However, these studies mainly focused on childhood and adolescence, rarely paying attention to later life stages such as emerging adulthood. Therefore, the current study attempted to replicate previous studies by comparing the well-being and life satisfaction of emerging adults of ASD-Sibs to ND-Sibs.

### **Transition to Adulthood**

Arnett (2000) proposed that emerging adulthood was neither adolescence nor young adulthood, and it was theoretically and empirically distinct from them both. He defined emerging adulthood as the period from the late teens through the twenties, with the emphasis on 18 to 25 years old. He summarized and proposed several unique characteristics of this life period, with the emphasis on making it an independent life period. First, emerging adulthood was distinct demographically. He suggested that emerging adulthood was the only period that covered a great amount of demographic change. Although the worldwide demographic keeps changing along with sociocultural development and creates abundant diversities, emerging adulthood accepts and allows wide scope of individual variation.

Secondly, emerging adulthood was distinct for identity explorations. Although identity development was traditionally linked with adolescence, Erikson (1968) proposed that industrialized societies would possibly prolong the identity exploratory processes of adolescents. In fact, it was during the emerging adulthood that life offered individuals adequate opportunities for identity exploration in the areas of education, romantic relationships, interpersonal relationships, and decisions of life. Arnett (2000) generalized these areas into three main categories: love, work, and worldviews. Not only did emerging adults have to deal with problems in these areas, but they were more willing to think about these questions seriously than during adolescence. For example, romantic relationships in emerging adulthood last longer than in adolescence, are more likely to include sexual intercourse, and may include cohabitation (Michael et al., 1995). Therefore, the identity

explorations were increased and went deeper instead of immediately ended along with the end of adolescence. Thus, the current study focuses on describing sibling relationships within the classification of “love” in this particular life stage of exploration.

Lastly, Arnett (2000) suggested that emerging adulthood is distinct subjectively. It was important to consider people’s subjective perception of their age stage to define the uniqueness and independency of that life period. When people in emerging adulthood were asked whether they felt they have reached adulthood, the majority of Americans in their late teens and early twenties answered neither no nor yes but the ambiguous in some respects yes, in some respects no (Arnett, 2000). The results of this interview question reflected emerging adults neither found themselves belonging to adolescence anymore, nor completely entered into young adulthood. Therefore, Arnett (2000) strongly argued that naming this life period clearly was important and necessary for both research and public areas.

### **Sibling Relationships and Well-being of Emerging Adults**

Emerging adulthood is a life stage consisting with lots of transitions and challenges, since this period is characterized by important experimentation and identity exploration. Additionally, emerging adults also need to deal with some tasks that will define adulthood, such as taking on responsibility, making autonomous decisions, completing education, and establishing financial and residential independence (Ponti & Smorti, 2019). These transitions challenge individuals in multiple aspects and sometimes require quick adjustment in a small amount of time. What is more, the life transitions also can disrupt the individual’s routines. For example, a study found that weekday sleep duration and efficiency declined during and

after high school, which further implied the developmental trends of worsening sleep during adolescents' transition to young adulthood (Park et al., 2019). In terms of emerging adulthood, the study of well-being represented by stress and potential distress should not be underrepresented in this particular life stage.

Sibling relations provide a significant social support for emerging adults to deal with life transitions (Conger & Little, 2010). Indeed, previous studies have shown that positive sibling relationships, characterized by warmth, affection, and emotional and instrumental support, are linked to an individual's well-being (Ponti & Smorti, 2019). On the contrary, sibling conflict is negatively associated with life satisfaction (Ponti & Smorti, 2019). Additionally, sibling warmth is associated with youth's self-disclosure and has the potential to alleviate youths' stress when faced with certain types of negative life events (Luthar et al., 2000).

Milevsky (2005) conducted research on sibling support in emerging adulthood and focused on its relationship with loneliness, depression, self-esteem, and life satisfaction. The results indicated that in emerging adulthood, sibling support was associated with lower loneliness and depression and with higher self-esteem and life satisfaction. Specifically, individuals receiving higher sibling support scored significantly lower on loneliness and depression, and significantly higher on self-esteem and life satisfaction, compared to those receiving lower sibling support scores. These results were consistent with previous studies on the effects of sibling support on children and older adults (Cicirelli, 1977, 1995; Gold, 1989; Milevsky, 2003; Sandler, 1980).

In summary, previous studies emphasized the importance of having a warm, closed, and supported relationship with siblings during emerging adulthood, however, research conducted on this period of life was still very limited. Therefore, I planned to examine how sibling warmth and closeness affect an individual's well-being (stress, distress), and life satisfaction during emerging adulthood, with the comparison of ASD-Sibs and ND-Sibs.

### **Sibling Relationships and Well-being of Emerging Adults Who Have Autistic Siblings**

The relationships between non-disabled siblings and their autistic brothers and sisters are considered different from “typical” sibling relationships (Tomeny, 2017). First, autistic siblings may exhibit a number of behavior problems besides the major symptoms, such as temper tantrums, self-injurious behavior, sleep and feeding problems and so on (Dominick et al. 2007; Ming et al., 2008). These problematic behaviors can negatively impact sibling relationships (Orsmond et al., 2009). Thus, the difficulties in non-disabled siblings’ relationships and in ND-ASD sibling relationships are different. There are more challenges and stressors for siblings of autistic children to deal with.

Second, despite these negative effects resulting from behavior problems and family stressors, many siblings reported positive features of their relationships with their siblings with ASD and expressed a sense of gratitude and felt they had gained positively and learnt from their autistic siblings (Tomeny, 2017). For example, Petalas (2009) indicated that siblings recognized positive qualities and traits in their sibling using qualitative methodology. From the quotation, these siblings said, “I like that he always shows who he is” and admired his sincere and genuine nature, or “what I like about Jack, he like knows absolutely loads



more than me” speaking with pride about the exceptional memories of his brother. Similarly, a recent study also examined how young adults viewed the strengths of their autistic siblings or intellectual disability (Carter et al., 2019). The results showed an overall portrait of strengths with the siblings' ratings of strengths in the moderate to high range. The positive assessment could result from siblings' gratefulness and optimism and is also associated with unique characteristics of autistic siblings.

Last, Tomeny et al. (2017) proposed that sibling-focused parentification was a predictor of distress and sibling relationship attitudes in non-disabled adult siblings of autistic individuals. Parentification refers to the phenomenon that children take responsibilities that are typically performed by their parents. From family system theory, families of autistic children are faced with more stress that may cause parents' incapability to take care of all the children. At this time, non-disabled siblings often feel the obligation to provide their autistic siblings with both physical and emotional supports. The results showed that non-disabled adult siblings who reported low sibling-focused parentification during childhood and low current social support were most likely to report less positive attitude about their relationships with their autistic siblings. Therefore, sibling relationships during young adulthood could be different for non-disabled siblings who lived with autistic sisters or brothers during childhood, compared to “typical” sibling relationships.

In summary, although previous research suggested differences between sibling relationships of ASD-group and ND-group, but the nature of these differences, particularly in young adulthood, still needs examination. Therefore, my study aimed to compare the

variation between two groups considering sibling relationships and well-being in emerging adulthood.

### **Coping, Coping Processes, and Coping Resources**

*Coping* is a psychological term which generally refers to cognitive and behavioral efforts to reduce, manage, or control negative effects caused by stressful events (Folkman & Lazarus, 1980). This process of dealing with challenging issues is commonly referred to *coping process*. *Coping resources* are viewed as antecedents of coping processes that can affect individual's well-being through specific coping processes. They are also important factors that can directly influence individual's psychological and physical health (Taylor & Stanton, 2007).

As Taylor and Stanton (2007) reviewed, coping resources generally consist of optimism, psychological control or mastery, self-esteem, and social support. Among these, optimism, psychological control, and self-esteem are personal disposition factors; and social support can be defined as either the perception of being loved and cared for by others, or the practical quantity and frequency of social contacts (Wills, 1991).

Coping processes are developed to describe how people react to stressful situations both emotionally and physically. Researchers also frequently use the terms coping strategies, coping responses or coping patterns to replace "coping processes", and their meanings are not different a lot from each other. The current thesis uses these terminologies interchangeably. The most common measurement of coping processes is the Kidcope Inventory (Spirito et al. 1988; Spirito 1996). It assesses people's cognitive and behavioral coping strategies. In more

detail, the content consists of ten items: distraction, social withdrawal, cognitive restructuring, self-criticism, blaming others, problem solving, emotional regulation, wishful thinking, seeking social support and resignation. This scale derives from previous investigators who classified coping processes depending on their functions (i.e., the alteration of a person-environment transaction vs. the regulation of emotion) and their modes of expression (direct action vs. cognition). According to these distinctions, four coping processes categories were identified: (1) cognitions about other people or the situation (e.g., placing blame); (2) cognitions directed at the self (e.g., attempts to control emotional reactions); (3) behaviors directed toward the environment (e.g., problem-solving activities); or (4) behaviors directed toward the self (including avoidance and withdrawal from a stressful situation). However, although these measures have been used to understand coping processes used by children who are faced with a number of difficulties such as their own disability or illness (e.g., Edgar & Skinner, 2003), far less is known about how well these measures can refer to emerging adult siblings of individuals with disability.

The question of how to select or create the most suitable classification of coping processes is still underdetermined and results in much space and flexibility for researchers to examine the phenomena. For example, a previous qualitative study examined coping strategies of siblings of patients with schizophrenia conducted by Stalberg, Ekerwald, and Hultman (2004) ultimately classified siblings coping processes as avoidance, normalization, caregiving, and grieving. These coping processes could be a better description of the conditions of siblings who have a brother or sister diagnosed with schizophrenia. Yet, in

terms of other different types of disability, such as ASD, whether this description is still applicable is unknown.

Hastings et al. (2005) explored coping strategies of parents of autistic children in detail and determined four categories: active avoidance (substance use, behavioral disengagement, venting, and distraction), problem-focused (planning, active coping, and use of instrumental and emotional support), religious/denial (find comfort in religious beliefs), and positive coping (positive reframe of potentially traumatic and stressful events). However, whether these categories can be directly applied to siblings is underexplored.

The current study attempted to explore how coping functions in the relations between sibling relationship and individual's psychological health, comparing siblings of autistic individuals with ASD and non-autistic individuals. Gratitude and optimism were intentionally selected to refer to coping resources. Daily emotion regulation was used to represent siblings' coping processes. Moreover, the current study also includes individual's resilience taken the more likelihood of negative interactions and life stressors that siblings of individuals with ASD experience.

**Gratitude.** Emmons and Crumpler (2000) proposed that gratitude is a personal disposition to feel and express thankfulness to something or someone. Although gratitude is not commonly considered as a type of coping resource, the current study suggests that it has similar functions as coping resources such as optimism and social support. A large amount of research has indicated that gratitude can positively predict people's well-being (e.g., Emmons & McCullough, 2003; Seligman et al., 2005). A recent study further confirmed that social

support and coping processes are essential mediators between gratitude and individual's subjective well-being (Lin, 2016). Specifically, Lin found that in the general population, grateful people are more likely to employ active coping strategies and therefore create more support to their well-being and capacity of resilience.

Recently, autism researchers started to view gratitude as a character strength that can potentially advance interventions for family members of autistic children. However, in contrast with the general population, the hypothesis that gratitude intervention can lead to a significant improvement in well-being of mothers of autistic children failed to be supported (Timmons & Ekas, 2018).

Gratitude is also a unique coping resource that often occurs in families of autistic individuals. Petalas et al. (2009) revealed that siblings express a sense of gratitude and felt their brother or sister teaches them how to care well for people and a lot of knowledge about autism in and of itself using a qualitative methodology. Thus, the current study attempted to use quantitative design as a supplement in order to examine whether there is significant difference of gratitude between siblings in the ND-group and the ASD-group.

**Optimism.** Optimism refers to the tendency of an individual to expect positive outcomes in life (Scheier & Carver 1985). Previous research has found that optimism is especially important in promoting better psychological functioning in mothers of autistic children and also in a variety of populations (e.g., Ekas et al., 2010). Willis et al. (2016) revealed that positive and avoidant coping strategies mediated the association between optimism and depressive symptoms for both mothers and fathers of autistic children, which is

very similar to the function of gratitude in affecting individual's well-being. Furthermore, although there were many studies investigating mother's and father's optimism of autistic children (e.g., Benson, 2010), sibling optimism has been rarely explored to the best of our knowledge. Therefore, the current study assessed both gratitude and optimism of siblings as indices of coping resources and compared the similarities of them.

**Daily emotion regulation.** Emotion regulation (ER) is a key component in child socioemotional development, and it is also an important component of adult coping processes. Lack of healthy emotion regulation strategies has been proven to associate with a range of clinical problems in adulthood (e.g., Ellard et al., 2010). Gross (1998) described emotion regulation as the process by which individuals monitor, control, and adjust their emotions in order to react appropriately to environmental demands. The most common emotion regulation strategies include: mindfulness, cognitive reappraisal and emotion suppression. All of them are widely used in both scientific research and clinical work. For example, one of the reasons of why cognitive reappraisal is well studied is because reappraisal is a core element in many forms of therapy such as cognitive behavioral therapy (Beck, 2005). The current study specifically focused on siblings' cognitive reappraisal and emotion suppression.

According to what Gross and Levenson (1993) defined, cognitive reappraisal is a process of cognitive change which involves changing one's interpretations of affective stimuli. It has been considered as an antecedent-focused strategy. In contrast, emotion suppression is a response-focused process that inhibits emotion-expressive behaviors. The

ongoing debate about whether emotion regulation strategies could be inherently good or bad has lasted for several years. One of the compelling opinions suggested that emotion regulation strategies are not necessarily adaptive or maladaptive depending on different contexts, personal characteristics, and purposes (Aldao, 2013). Recently, more empirical research was conducted and revealed that reappraisal may be adaptive under specific circumstances, such as when stressors are uncontrollable (Troy et al., 2013). Therefore, we need to clarify that emotion regulation strategies per se are not good or bad, their essence should be explained along with contexts.

Although more attention has been paid to emotion regulation, few studies have examined it from a dynamic and daily perspective (Kashdan & Steger, 2006). Most studies have viewed it as a stable trait of people and tested it using retrospective measurements (Nezlek & Kuppens, 2008). Previous studies have found that daily cognitive reappraisal could result in better adjustment, while daily emotion suppression is associated with higher negative and lower positive affect (Brockman et al., 2017).

Highlighting the potential developmental risks for siblings of autistic individuals, many intervention programs focus on improving siblings' social understanding and emotion regulation as main parts of social cognitive development (McHale et al., 2016). However, far less is known about how emerging-adult siblings of autistic individuals use specific emotion regulation strategies compared to siblings of non-disabled individuals. In addition, previous studies have shown that children's higher level of emotion regulation is linked with better sibling relationship quality (Kennedy & Kramer, 2008). That being said, strengthening

children's ER is valued as a process for improving prosocial sibling relationships. We need to examine the finding for participants in emerging adulthood, and also explore whether the same pattern occurs in ASD families as well.

**Resilience.** Resilience usually refers to the ability to rebound from crisis and distress (Hawley & DeHaan, 1996). Sibling resilience is rarely explored in autism research despite of its great impact on sibling well-being and adjustment. Some existing literature suggested that the sibling relationship can cause both risks and resilience, depending on relationship dimensions including warmth and rivalry (Dirks et al., 2015). However, there is large space for researchers to explore resilience of siblings who have an autistic brother or sister, and how their relationship affects levels of resilience. Resilience can not only be a personal trait but also be an outcome that reflects individual's adaptability and adjustment when facing with stressful situations (Glantz & Sloboda, 2002).

### **Current Study**

The current study aimed to examine the relationship among sibling warmth, coping, and distress with the comparison of ND-group (both the participant and their sibling are non-disabled) and ASD-group (the participant is non-disabled and their sibling has been diagnosed with ASD). Both coping resources and coping strategies are assessed to reflect siblings' coping styles comprehensively. There were three main hypotheses: a) siblings in ASD-group will report less sibling warmth and higher scores of distress compared to siblings in ND-group; b) for both groups, sibling warmth could affect levels of distress by influencing



individual's gratitude and optimism attitude, and emotion regulation strategies; c) sibling warmth can predict resilience through gratitude and optimism.

## CHAPTER 2: METHOD

### Participants and Procedures

The current study used parts of data from a single online survey consisting of multiple questionnaires. The whole survey took about 20-30 minutes for participants to complete. Participants were recruited through flyers and in-class announcements on Virginia Tech's campus. Considering the difficulty of recruiting siblings of autistic individuals, Prolific ([prolific.co/](https://prolific.co/)) was also used to recruit participants across the United States. RedCap, a secure, online data platform was used to collect and store the dataset for further analyses. There were both ASD-Sibs and ND-Sibs who were recruited from Virginia Tech, and all of them received extra course credits as compensation. We used Prolific for recruiting only ASD-Sibs, and they were offered appropriate financial compensation as the Prolific platform recommended. Students from Virginia Tech were offered extra credit in a course as compensation.

The total sample size in the current thesis was 99, consisting of 26 siblings of autistic individuals and 73 participants who have non-disabled siblings. As for the ASD-Sibs in this study, 6 of them were from Virginia Tech, and 20 of them were recruited through Prolific. All the participants in my study are non-disabled, without any type of disability, as their self-report. In addition, the recruited participants also met all the following criteria: 1) age between 18-25; 2) English speakers; 3) nationality is the U.S. There were 49 records indicating that someone accessed the survey, but didn't complete it. These records were not used in our further analysis.

The demographic questionnaire included basic information such as age, gender and type of disability, and also consists of sibling type (full sibling, cross sibling, foster sibling, etc), employment status (college, full time, part time, or unemployed), and perceived family socioeconomic status (SES). There are twofold reasons for using perceived SES instead of actual amount of family income. First, the online survey provided a large potential of geographical diversity, which made perceived SES a more efficient and reflective way to catch the real condition. Second, some study did a meta-analytic review of the association between objective and subjective socioeconomic status and subjective well-being (SWB) and found the subjective SES-SWB association was larger than the objective SES-SWB association (Tan et al., 2020). Therefore, perceived SES is a better choice to suit our study purpose. Finally, to ensure reliabilities of diagnoses, we included a question for the siblings who have an autistic brother or sister: “To the best of your knowledge, was this disability diagnosed by a professional?”.

### **Age**

Age of a participant’s sibling was not restricted. All age groups were analyzed, compared. If necessary, sibling age will be controlled for in the final analyses. If the participants in ND-group had more than one sibling, the sibling with the closest age was required to be targeted in answering the questions. Similarly, if the participants in ASD-group had more than one autistic sibling, then the sibling with the closest age should be targeted in answering the questions. The participants are aged between 18 and 25 years old ( $M = 21.05$ ,

$SD = 1.80$ ). As for their siblings, the age range is between 8 and 37 years old ( $M = 21.41$ ,  $SD = 5.32$ ).

### **Gender**

For participants, 82.8% are female, 16.2% are male, and 1% is considered themselves as nonbinary gender. For their siblings, 42.4% are female, 55.6% are male, 1% is transgender, and 1% is nonbinary gender. Considering the gender difference of diagnosis of ASD is about 4 males :1 female in general, equal representation of gender across ASD-group and ND-group is not expected. Therefore, the data were examined considering gender of sibling in the following analyses. In ND-group, gender ratio of female and male is about 1:1. Yet, in the ASD-group, gender ratio of autistic siblings is 69.2% : 23.1% (male : female). Therefore, in the current study, there is group difference in terms of siblings' gender.

### **Race and Ethnicity**

There are 75.8% of the total participants who are White, 9.1% African American, 9.1% Asian, 4% Hispanic or Latino, 1% multiple races, and 1% missing values.

### **Perceived SES**

There is no significant difference of perceived SES between two groups (ND-group and ASD-group). However, 83.8 percent of the total participants assessed their family's socioeconomic class as middle class or above middle class. Thus, our sample may not generalize to all the population, particularly may not generalize to the siblings who define themselves living in lower SES class families.

### **Sibling Types**

Many sibling studies failed to report sibling types or merely included full siblings in their study without further explanation of the intentional exclusion. Nowadays, with the increased inclusiveness of different family and marriage types, the complexity of sibling compositions in families should be considered more than before (Sanner et al., 2018). In the current study, 84.8% of the total participants have a full biological sibling, 14.1% have a half sibling (e.g., share one biological parent), and 1% defined the sibling type as “Other”. There is no apparent difference of sibling type compositions between two groups.

### **Birth Order**

For the siblings in the ND-group, 50.7% of them were younger than their siblings and 45.2% of them were older than their siblings. Missing values accounted for 4.1%. For the siblings in the ASD-group, 30.8% of them were younger than their autistic siblings and 65.4% of them were older than their autistic siblings. Missing values accounted for 3.8%.

### **Questionnaires**

**Sibling Warmth.** The Adult Sibling Relationship Questionnaire (ASRQ; Stocker, Lanthier, & Furman, 1997) consisted of 81 items assessing three dimensions: warmth, conflict, and rivalry. Considering the time consumption and research interests, my study will specifically choose the warmth subscale reflecting a positive aspect of sibling relationships, which includes 25 questions. For all the items in warmth subscale, participants will rate how characteristic each item is of themselves and of their sibling, using Likert scales ranging from hardly at all (1) to very much (5), higher scores indicating more warmth exists between

siblings. The scoring of warmth subscale is averaging each item. The original questionnaire factor scores show high levels of internal consistency and test–retest reliability (Stocker, Lanthier, & Furman, 1997). In previous study, internal reliability of Warmth subscale was  $\alpha = .94$  (Finzi-Dottan & Cohen, 2010). In the current study, the internal consistency of warmth subscale is also quite satisfying (Cronbach's  $\alpha = .97$ ).

**Distress.** K-6 (Kessler et al., 2002), a brief version of the K10 screener for psychological distress was developed for the United States National Health Interview Survey (NHIS). These items are rated on a 5-point Likert scale (1 = never to 5 = all the time), and relate to nervousness, hopelessness, restlessness, the feeling that everything takes too much effort, sadness, and worthlessness. A total score above 14 was considered indicative of a clinically relevant anxiety or depression (Staples et al., 2019). The K-6 also indicated satisfying internal consistency in the present study (Cronbach's  $\alpha = .88$ ).

**Gratitude.** Gratitude Questionnaire (GQ-6; McCullough et al., 2002) is a six-item scale that measures an individual's tendency to experience gratitude. There are four items positively reflecting gratitude (I have so much in life to be thankful for) and two items that are reverse scored (Long amounts of time can go by before I feel grateful to something or someone). Previous research has shown great reliability and construct validity of GQ-6 (e.g., McCullough et al., 2004). The GQ-6 also indicated satisfying internal consistency in the present study (Cronbach's  $\alpha = .75$ ).

**Optimism.** The Revised Life Orientation Test (LOT-R) is widely used to test individuals' optimism level. The reliability and validity of it is supported by substantial

research (Scheier et al., 1994; Burke et al., 2000). All the ten items are rated from 0 (strongly disagree) to 4 (strongly agree). Dispositional optimism is calculated by averaging together the 3 positively worded items (e.g., I'm always optimistic about my future) with the 3 negatively worded items that are reverse scored (e.g., I rarely count on good things happening to me).

The LOT-R also demonstrated satisfying internal consistency in the present study

(Cronbach's  $\alpha = .86$ ).

**Daily Emotion Regulation.** The initial questionnaire was Emotion Regulation Questionnaire (Gross & John, 2003), which examined trait emotion regulation. However, the current study aimed to focus more on the unstable emotion regulation of siblings. Kashdan and Steger (2006) selected 8 of the 10 items with the highest factor loadings and modified them to assess strategic attempts to modify mood during the day. Two strategies were measured by the scale: emotion suppression and cognitive reappraisal (4 items for each, rated on 7-point scales). Their results indicated that both the suppression (.97) and reappraisal (.97) subscales had acceptable reliability. In the current study, the internal consistency was also satisfying with the suppression (.87) and reappraisal (.86).

**Resilience.** The Brief Resilience Scale (BRS) was developed by Smith et al. (2008) and was used to assess the ability to bounce back or recover from stress, e.g., I tend to bounce back quickly after hard time. It includes 6 items with the 5-point Likert scale (1 = Strongly disagree and 5 = Strongly agree). Higher scores indicate greater resiliency. In the present study, the BRS have acceptable Cronbach alpha (.90)

### **Data Analysis Plan**

IBM SPSS Statistics software version 26 was used to conduct all analyses. For each variable, the percentage of missing values was less than 5%. Missing values imputation was conducted to ensure we make the best use of the data. First, descriptive analyses were used to depict the demographic variables and core variables between two groups. Correlation analyses were used to depict relationship among sibling relationship, coping resources, and individual's well-being. Second, two sample T-tests were used to compare well-being, coping resources, and sibling relationships of emerging adults with ND siblings and ASD siblings. Third, we conducted two linear regression analyses to examine the association between demographic variables, group (ASD-group or ND-group), sibling relationship, coping (optimism, gratitude, and emotion regulation), and either outcome variables, distress and resilience. Hierarchical linear regression was conducted with the order of demographic variables, independent variable, and coping variables. Finally, mediation models were used to reflect the association between sibling relationships and individual's distress or resilience. ANOVA analysis was conducted to decide which demographic variables should be controlled as covariates in the mediation models.



## CHAPTER 3: RESULTS

### Preliminary Analysis

Demographic information was presented in Table 1. The difference between ASD-Sibs recruited through Virginia Tech classes and Prolific was calculated using independent two-sample T-test. There was no significant difference between ASD-Sibs recruited from Virginia Tech and Prolific (See Table 2). In addition, for the participants who were older than their siblings in report, they reported significantly higher level of distress ( $p < .05$ ) and more emotion suppression ( $p < .05$ ) than the participants who were younger than their siblings (See Table 3).

### Correlations

As Table 4 shows, the perceived socioeconomic status of participants is negatively correlated with the score of distress and participant age. Participant age is negatively correlated with gratitude, while has positive correlations with sibling age, distress, and emotion suppression. Sibling warmth is positively correlated with gratitude, optimism, and cognitive reappraisal, whereas negatively correlated with distress and emotion suppression. Participants' distress is positively correlated with emotion suppression, and negatively correlated with gratitude, optimism, and cognitive reappraisal. Resilience is negatively correlated with distress and emotion suppression, whereas positively correlated with gratitude, optimism, and cognitive reappraisal. Optimism is positively correlated with gratitude and cognitive reappraisal. Gratitude is positively correlated with cognitive reappraisal and negatively correlated with emotion suppression.

### **Independent-sample T-tests**

The results were presented in Table 5. The ND group reported higher sibling warmth ( $p < .001$ ) and gratitude ( $p < .001$ ). Meanwhile, the ASD group indicated significantly higher emotion suppression than the ND group ( $p = .001$ ). No significant difference was found in terms of resilience, optimism, cognitive reappraisal, and distress between two groups.

### **Regression**

Results of the linear regression analyses were presented in Tables 6 and 7. Participant age, sibling warmth, optimism, and daily emotion regulation (cognitive reappraisal and emotion suppression) were predictive of siblings' level of distress. Specifically, optimism, cognitive reappraisal, and emotion suppression have significant effects on distress ( $p < .05$ ). Furthermore, resilience, as an outcome variable, could be predicted by race, optimism, and gratitude. All of the predictors had significant effect on siblings' resilience ( $p < .05$ ).

### **Indirect Effects of the Relationship between Sibling Warmth and Distress**

**Emotion suppression as the mediator.** Distress was significantly different according to participant age, birth order, and perceived SES ( $p < .05$ ). The relationship between sibling warmth and distress was partially mediated by emotion suppression, with participant age, birth order and SES being controlled as covariates. As Figure 1 illustrates, the standardized regression coefficient between sibling warmth and emotion suppression was statistically significant ( $\beta = -.26, p = .009$ ), as was the standardized regression coefficient between emotion suppression and distress ( $\beta = .31, p = .003$ ). Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval ranged

from -1.02 and -0.06. Thus, the indirect effect was statistically significant whereas the direct effect was not statistically significant ( $\beta = -.90, p > .05$ ). The model suggested that if sibling relationship was reported as having more warmth, siblings might use less emotion suppression strategies, which further reduced sibling distress. However, sibling warmth may not directly reduce individual's distress.

**Gratitude as the mediator.** We also tested whether sibling warmth predicts distress by influencing gratitude. As Figure 2 showed, the relationship between sibling warmth and distress was partially mediated by gratitude, with participant age, birth order, and SES being controlled as covariates. The standardized regression coefficient between sibling warmth and gratitude was statistically significant ( $\beta = .24, p = .02$ ), as was the standardized regression coefficient between gratitude and distress ( $\beta = -.35, p < .001$ ). Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval ranged from -1.08 and -0.10. Thus, the indirect effect was statistically significant whereas the direct effect was not statistically significant ( $\beta = -.87, p > .05$ ). The second model illustrated that if siblings had warmer relationship with their brother or sister, they tended to be more grateful, which may lead to less distress. However, sibling warmth may not directly reduce individual's distress.

**Optimism as the mediator.** Similarly, we examined whether sibling warmth predicts distress by influencing optimism. As Figure 3 presented, the relationship between sibling warmth and distress was partial mediated by optimism, with participant age and SES being controlled as covariates. The standardized regression coefficient between sibling warmth and

optimism was statistically significant ( $\beta = .38, p < .001$ ), as was the standardized regression coefficient between optimism and distress ( $\beta = -.49, p < .001$ ). Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval ranged from -1.94 and -0.48. Thus, the indirect effect was statistically significant whereas the direct effect was not statistically significant ( $\beta = -.27, p > .05$ ). The third model illustrated that if siblings had warmer relationship with their brother or sister, they tended to have more optimistic attitudes, which may lead to less distress. However, sibling warmth may not directly reduce individual's distress.

### **Indirect Effects of the Relationship between Sibling Warmth and Resilience**

**Gratitude as the mediator.** As our hypotheses indicated, we also explored the relationship between sibling warmth, gratitude, and resilience. With resilience being the outcome variable, we found that the relationship between sibling warmth and resilience was fully mediated by gratitude (See Figure 4). The standardized regression coefficient between sibling warmth and gratitude was statistically significant ( $\beta = .27, p = .006$ ), as was the standardized regression coefficient between optimism and distress ( $\beta = .40, p < .001$ ). Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval ranged from -2.03 and -0.52. Thus, the indirect effect was statistically significant. The direct effect was not statistically significant ( $\beta = -.02, p > .05$ ) and the total effect was not significant either ( $\beta = .11, p > .05$ ). The fourth model illustrated that if siblings had warmer relationship with their brother or sister, they tended to be more

grateful to life, which may lead to higher resilience. However, sibling warmth may not directly increase individual's resilience.

**Optimism as the mediator.** Furthermore, we examined the relationship between sibling warmth, optimism, and resilience. With resilience being the outcome variable, we found that the relationship between sibling warmth and resilience was fully mediated by optimism (See Figure 5). The standardized regression coefficient between sibling warmth and optimism was statistically significant ( $\beta = .38, p < .001$ ), as was the standardized regression coefficient between optimism and distress ( $\beta = .48, p < .001$ ). Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval ranged from 0.07 and 0.38. Thus, the indirect effect was statistically significant. Neither the direct effect was statistically significant ( $\beta = -.10, p > .05$ ) nor the total effect ( $\beta = .11, p > .05$ ) was. The fourth model illustrated that if siblings had warmer relationship with their brother or sister, they tended to have more optimistic attitudes, which may lead to higher resilience. However, sibling warmth may not directly increase individual's resilience.

## CHAPTER 4: DISCUSSION

### **The Purpose of the Study**

The purpose of the study was to explore how sibling relationship affects emerging-adult well-being and resilience with the comparison of siblings of individuals with ASD and siblings of non-disabled individuals. Coping resources and coping processes were measured to examine the role of coping in influencing siblings' well-being. As the results revealed, optimism, gratitude, and emotion suppression were potentially mediators that affected how sibling warmth related to individual's distress. However, the current study failed to find group difference in terms to this relationship due to limited sample sizes in each group. In addition, siblings in the ASD-group reported significantly less sibling warmth, less gratitude, and more emotion suppression than siblings in the ND-group. The finding was consistent with previous research that people tended to report distant relationship with their autistic siblings because of the autism-related traits and fewer communications (Orsmond & Seltzer, 2007). The notable findings in the current study included different coping strategies and resources siblings in the ASD-group used compared to those in the ND-group during emerging adulthood. The current study proposed that the difference of coping styles may be the underlying mechanism of worse well-being of siblings, and more perceived sibling warmth may be a buffer for ASD-Sibs' resilience and coping.

### **Sibling Relationships and Distress**

The current study provided a new insight about connecting sibling relationship with individual's distress. Most previous studies used siblings' adjustment and maladjustment to

reflect their life conditions, including mother-reported Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2000). Some of the results suggested that coping strategies of siblings were not associated with their adjustment (e.g., Ross & Cuskelly, 2006). However, the examination of siblings' emotional health and psychiatric symptoms was somehow underexplored (e.g., Schwartz 2003). Findings from the current study pointed out that siblings' coping strategies did influence their levels of distress during the last 30 days. Additionally, their coping styles were likely to be affected by sibling relationships. For instance, higher sibling warmth may increase siblings' gratitude and optimism attitude, and hence reduce their distress. There were large number of empirical studies compared behavioral challenges and maladjustment between siblings of autistic individuals and siblings of non-disabled individuals (e.g., Tomeny et al., 2012). With decades of efforts in academia, the results for behavioral challenges among ASD-Sibs compared to ND-Sibs were mixed. Some samples of ASD-Sibs reported higher levels of certain challenging behaviors than comparison groups (e.g., Gau, 2010), and others revealed results in which the ASD-Sibs sample had levels of behavior problems significantly below normative levels (e.g., Hastings, 2003). Therefore, more researchers tended to seek meta-analysis for summarizing the mixed results and providing a comprehensive conclusion. The current study can serve as an important evidence for researchers to conduct meta-analysis on siblings' coping and their well-being among people who have an autistic brother or sister.

Gratitude was found to be an extremely important coping resources for ASD-Sibs.

The finding had essential implication for clinical interventions targeting families of autistic

individuals, including non-disabled children. Siblings who had an autistic brother or sister reported less gratitude attitude than ND-Sibs, which potentially resulted in poorer psychological health. However, previous coping research neglected gratitude and did not generally list it as one of the major coping resources such as optimism. In the current study, we found that gratitude can affect siblings' well-being as much as optimism, and it can exert even more positive effect in ASD-Sibs. Some previous studies illustrated how gratitude can influence people's well-being by affecting their coping strategies (Lin, 2016). Although the current study did not specifically examine the association between gratitude and coping processes, future studies should pay more attention to explore whether it is appropriate to include gratitude as a type of coping resource.

The current study also discussed how daily emotion regulation (ER) could be a meaningful index reflecting siblings' well-being. Some studies have revealed the consistency of trait ER and daily ER since their measurement items were overlapped and very similar (Kashdan & Steger, 2006). The reason why we viewed ER as a dynamic concept in our study was that daily ER was neglected in autism sibling research and it was fairly necessary. Generally, autism sibling research was a novel and emerging topic that still focused on descriptive analyses and retrospective methodology. The current study aimed to advancing the area by including some dynamic variables and providing foundations for further laboratory experiments.

Results from our study indicated that better sibling relationship could increase siblings' coping resources and decrease the use of negative coping strategies. However,



participants reported significantly less warmth with their autistic siblings compared to ND-Sibs. For ND-Sibs, positive sibling relationship and coping resources can be effective buffers for their distress. However, the link between less sibling warmth and fewer coping resources is related to a harsher condition for ASD-Sibs to have a better psychological health or less emotional problems. More importantly, the results in our study highlighted the importance of providing the interventions that focused on not only coping strategies but also sibling relationship.

### **Indirect Links to Sibling Warmth and Resilience**

The results of resilience were consistent with our assumptions. First, the difference between resilience of ASD-Sibs and ND-Sibs was not significant, which fit with previous research and resilience theories (e.g., Heiman, 2002). There was accumulated evidence supporting that resilience is more common than often believed, especially among people growing up in disadvantaged conditions or under chronic stress (Bonanno, 2008). Therefore, living with or having an autistic sibling did not necessarily lead to lower individual resilience. Second, gratitude and optimism could be potential mediators affecting the relationship between sibling warmth and individual's resilience. For siblings who have warmer relationship with their brother or sister, they tended to be more grateful and optimistic for life, which can increase their capability of remaining equilibrium when faced with stressful events. However, due to the limited sample size, the current study failed to examine whether different groups can moderate this relationship. ASD-Sibs reported significantly lower level of sibling warmth and gratitude, which was very likely to reduce

their resilience. However, the result showed a very small and non-significant difference between resilience of ND-Sibs and ASD-Sibs. Thus, group was unlikely to be a moderator that could influence the relationship. Further study should be determined to expand sample size and discuss this question.

### **Theoretical Connections**

The current study was based on the family systems theory and the life course theory. The findings from this study could also advance our understanding of the theoretical frameworks.

**Family systems theory.** Emerging from general systems theory, family systems theory was developed to explain the wholeness and interconnection among all parts in the system (Allen & Henderson, 2016). Although few studies in autism sibling research mentioned family systems theory as theoretical guidance, it did contribute much to this area and should be cited much more than the status quo. For example, family systems theory proposed the concepts of family system and mutual influence. Both concepts supported the opinion that sibling relationships can have a huge impact not only on each other but also on other subsystems. Theoretically, family systems theory laid the groundwork for this research area.

In addition, family cohesion and adaptability were important concepts from the family systems theory (Horowitz & Kazak, 1990). Family cohesion meant the emotional bonding of the whole system or various subsystems. There could be varying levels of cohesion across different subsystems. For families of autistic children, the sibling subsystem was of

heightened importance since the sibling relationship might be the first and most intense peer relationship (Powell & Gallagher, 1993). Therefore, cohesion between non-disabled siblings and their autistic brothers or sisters is an important factor to reflect their relationship quality. Adaptability referred to the ability to change in demand to stressful life events. Normally, stress was a big threat to family equilibrium. Therefore, the adaptability of sibling subsystem, and individual's resilience were also important factors to be considered. In our study, we revealed that sibling warmth was especially important for ASD-Sibs' well-being and their individuals' resilience.

**Life course perspective.** Although the life course perspective has been integrated in different research topics for a long time, the emphasis on some life stages and life transitions in autism sibling research was still insufficient. It had several contributions on the current study. First, it emphasized the explorations of life transition periods and turning points. Emerging adulthood is one of the most important transition periods in people's lives (Bengtson & Allen, 2009). However, few studies examined how non-disabled emerging adults who have autistic siblings coped with the stress and distress in this transition period. Future studies should be conducted to examine specific stressors in emerging adulthood using mixed methodology. Additionally, life course perspective proposed the concept of linked lives to illustrate the way in which significant others' lives were interlocked (Bengtson et al., 2012). Sibling relationships were important and should be explored in different life stages. Therefore, to guide future studies in this area, life course perspective should be added due to its emphasis on life transitions and long-standing perspective. Our study supplemented

Goetting's (1986) siblingship theory by adding ASD-Sibs into the theoretical framework.

Although siblings tended to provide financial and emotional support to each other during young adulthood, ASD-Sibs were likely to face more challenges by their own.

### **Implications for Practice**

For emerging-adult siblings who have an autistic brother or sister, intervention towards gratitude is needed. Many emerged studies showed gratitude intervention can improve individuals' well-being. Rash et al. (2011) conducted a 4-week gratitude contemplation intervention program and found that participants in the gratitude condition reported higher satisfaction with life and self-esteem. There were also international findings that illustrated similar efficacy of gratitude. Chan (2009) assessed the dispositional gratitude and its relationships with happiness in a sample of Chinese school teachers in Hong Kong. The results of Chan's study indicated that the effects of the gratitude intervention were evident in the increase in scores on satisfaction with life and on positive affect, especially for teachers in the low-gratitude group. Since emerging-adult ASD-Sibs also reported low gratitude compared to ND-Sibs, this study supported our idea that gratitude intervention could be extremely helpful for this population, even for other family members of individuals with ASD.

In addition, the current study also advocated that sibling therapy should be applied for ASD-Sibs. Shivers and Plavnick (2015) conducted a systematic review and concluded that method for including siblings in treatment for autistic individuals was still insufficient. Taken the condition into account, including autistic siblings in treatment for ASD-Sibs is

more notable and underexplored. As far as the knowledge, since few clinical professionals or family therapist got training about treatment involving both ASD-Sibs and people with ASD, the effect of the type of intervention was rarely examined. Therefore, future studies should explore how efficacy the intervention will be after involving autistic siblings into the treatment targeting to ASD-Sibs by collaborating with practitioners.

### **Limitations and Future Directions**

The present study had several limitations that may be addressed with future research. First, due to the limited sample size, the current study failed to reveal whether there are group differences in each mediation model. We conducted post-hoc analysis of moderated mediations with group as the moderator. Yet, since the limited sample size, none of the moderated mediation models were statistically significant. Second, although the current study specifically targeted to emerging adulthood, it failed to reflect the uniqueness of this life stage in terms of sibling relationship, coping, and psychological health. Therefore, although a longitudinal design usually costs a lot of time and needs sufficient funding, it should be applied to this topic for examining changes of these models across a long-span time. Finally, the current study only conducted one-time online survey. Although daily emotion regulation questionnaire was selected to add dynamic processes, the current study had limitations derived from not conducting any laboratory experiment.

There are some other potential mediators that were not included in the current study, such as sibling-parentification and family resilience. Tomeny et al. (2017) examined how different types of parentification during childhood related to distress outcomes and attitudes

about sibling relationship among adult siblings of individuals with ASD. They revealed that sibling-focused parentification was a unique predictor of positive sibling relationship attitudes. Therefore, sibling-focused parentification could potentially be an antecedent factor that affects self-report sibling warmth. In addition, a review conducted by Smith et al. (2010) emphasized the importance of the context of ASD-Sibs including family culture, family resilience and etc. Thus, family resilience could be a meaningful supplement for individuals' resilience.

### **Conclusion**

The current study explored the association among sibling relationships, coping, and well-being of emerging adults who have non-disabled siblings or siblings with ASD. We found that siblings of individuals with ASD reported significantly less sibling warmth, less gratitude, and more emotion suppression than siblings of a non-disabled brother or sister. In addition, optimism, gratitude, and emotion suppression were potentially mediators that affected how sibling warmth related to individual's distress. Furthermore, optimism and gratitude could be mediators that influenced the relationship between sibling warmth and individual's resilience. In conclusion, the current study proposed that the difference of coping styles may be the underlying mechanism of worse well-being of siblings, and more perceived sibling warmth may be a buffer for ASD-Sibs' resilience and coping. Future interventions for ASD-Sibs should consider include gratitude improvement treatment and involve their autistic siblings.

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## Tables

**Table 1.** *Demographic Information*

age						
	Range	Mean	SD			
Participant_age	18-25	21.05	1.8			
Sibling_age	8-37	21.41	5.32			
Gender						
	Female	Male	Transgender	Nonbinary Gender		
Participants	82.80%	16.20%		1%		
Siblings without ASD	49.30%	50.70%				
Siblings with ASD	23.10%	69.20%	3.80%	3.80%		
Race and Ethnicity						
	White	African American	Asian	Hispanic or Latino	Multiple races	Missing
Participants	75.80%	9.10%	9.10%	4%	1%	1%
Perceived SES						
	Lower or Lower Middle Class	Middle Class or Above				
Participants	16.20%	83.80%				
Sibling Type						
	Full Biological Sibling	Half Sibling	Other			
	84.80%	14.10%	1%			
Birth Order						
	Younger	Older	Missing			
Participants	45.50%	50.50%	4%			
Recruited from						
	Virginia Tech	Prolific				
ASD-Sibs	23.10%	76.90%				
ND-Sibs	100%	0				

**Table 2.** *Study Variables for ND-Sibs and ASD-Sibs*

	N	Minimum	Maximum	Mean	STE	Skewness	Kurtosis
Sibling Warmth							
1	73	2	5	3.61	0.73	-0.33	-0.18
2	26	1	5	2.87	0.94	-0.33	-0.29
Gratitude							
1	73	23	42	37.12	4.69	-1.06	0.73
2	26	21	42	32.77	5.62	-0.09	-0.78
Optimism							
1	73	8	30	19.70	4.83	-0.01	-0.42
2	26	6	30	18.12	5.62	-0.51	0.37
Distress							
1	73	0	24	12.08	4.82	0.31	-0.46
2	26	6	23	13.73	4.57	0.47	-0.33
Emotion Suppression							
1	73	6	26	14.23	5.33	0.28	-0.98
2	26	7	28	18.69	5.97	-0.38	-0.68
Cognitive Reappraisal							
1	73	7	26	19.15	4.30	-0.95	0.61
2	26	5	28	18.65	5.45	-0.81	0.50
Resilience							
1	73	0	5	3.33	0.88	-0.96	1.90
2	26	1	5	3.18	1.13	-0.33	-0.75

Note: 1: ND-Sibs; 2: ASD-Sibs

**Table 3.** *Difference between ASD-Sibs Recruited from Virginia Tech and Prolific*

	<i>F</i>	<i>df</i>	<i>p</i>	Mean Difference	<i>SE</i>
Perceived SES	0.02	24	0.26	0.45	0.39
Sibling warmth	1.04	24	0.72	0.16	0.44
Gratitude	2.58	24	0.91	0.30	2.67
Optimism	0.39	24	0.96	-0.15	2.67
Distress	0.07	24	0.87	0.35	2.17
Emotion Suppression	1.58	24	0.83	0.61	2.83
Cognitive Reappraisal	0.54	24	1.00	0.02	2.59
Resilience	0.08	24	0.92	-0.06	0.54

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$

**Table 4.** *Difference between Participants Who Were Younger and Older Than Their Siblings*

	<i>F</i>	<i>t</i>	<i>df</i>	<i>p</i>	Mean Difference	<i>SE</i>
Perceived SES	0.50	1.45	93	0.15	0.26	0.18
Sibling Warmth	0.02	0.52	93	0.60	0.09	0.17
Gratitude	0.07	1.72	93	0.09	1.87	1.09
Optimism	2.64	1.04	93	0.30	1.10	1.06
Distress	0.05*	-2.12	93	0.04	-2.07	0.97
Emotion Suppression	0.45*	-2.48	93	0.02	-2.88	1.16
Cognitive Reappraisal	0.12	0.00	93	1.00	0.00	0.96
Resilience	2.29	-0.26	93	0.79	-0.05	0.19

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$

**Table 5.** *Correlations for Study Variables*

	1	2	3	4	5	6	7	8	9	10	11
1. Participant Age	-										
2. Perceived SES	-0.45**	-									
3. Sibling Quantity	0.13	-0.19	-								
4. Sibling Age	.27**	0.02	0.12	-							
5. Sibling Warmth	-0.13	0.02	0.03	-0.03	-						
6. Gratitude	-.24*	0.07	-0.10	0.15	.27**	-					
7. Resilience	0.03	-0.11	0.03	0.09	0.15	-.22*	-				
8. Optimism	-0.10	0.12	0.06	0.15	.38**	.48**	0.50***	-			
9. Distress	.24*	-.21*	0.06	-0.13	-.24*	-.44**	-0.46**	-.55**	-		
10. Emotion Suppression	.22*	-0.17	-0.05	-0.12	-.32**	-.44**	-0.25*	-.49**	.39**	-	
11. Cognitive Reappraisal	-0.10	-0.06	-0.13	-0.04	.20*	.30**	0.28**	.26**	-.41**	-0.03	-

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$



**Table 6.** *Independent-sample T-tests*

	<i>F</i>	<i>t</i>	<i>df</i>	<i>p</i>	Mean Difference	SE
Sibling Warmth	2.22***	4.14	97	0.00	18.61	4.49
Gratitude	2.62***	3.85	97	0.00	4.35	1.13
Resilience	0.10	-1.14	97	0.26	-0.09	0.08
Optimism	0.11	1.38	97	0.17	1.59	1.15
Distress	0.42	-1.52	97	0.13	-1.65	1.09
Emotion Suppression	0.04***	-3.55	97	0.00	-4.47	1.26
Cognitive Reappraisal	1.84	0.47	97	0.64	0.49	1.06

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$

**Table 7.** *Regression Analysis Results for Distress Outcome*

Step	Predictor	<i>B</i>	SE	$\beta$	<i>t</i>	<i>p</i>
1	Participant_Age	0.622	0.273	0.232	2.276	0.025
2	Participant_Age	0.547	0.269	0.204	2.036	0.045
	Sibling Warmth	-1.339	0.572	-0.235	-2.342	0.021
3	Participant_Age	0.472	0.235	0.176	2.013	0.047
	Sibling Warmth	-0.224	0.539	-0.039	-0.415	0.679
	Optimism	-0.48	0.088	-0.513	-5.439	0.000
4	Participant_Age	0.423	0.224	0.158	1.888	0.062
	Sibling Warmth	-0.007	0.518	-0.001	-0.014	0.989
	Optimism	-0.432	0.085	-0.461	-5.052	0.00
	Cognitive Reappraisal	-0.281	0.089	-0.272	-3.153	0.002
5	Participant_Age	0.339	0.224	0.126	1.51	0.135
	Sibling Warmth	0.117	0.513	0.021	0.228	0.82
	Optimism	-0.347	0.094	-0.371	-3.698	0.000
	Cognitive Reappraisal	-0.307	0.089	-0.297	-3.462	0.001
	Emotion Suppression	0.161	0.08	0.194	2.014	0.047
Model 1	Adjusted $R^2 = .054, p < .05$					
Model 2	Adjusted $R^2 = .108, p < .01$					
Model 3	Adjusted $R^2 = .331, p < .001$					
Model 4	Adjusted $R^2 = .399, p < .001$					
Model 5	Adjusted $R^2 = .425, p < .001$					

*Notes:* *B*: unstandardized coefficient. SE: standard error.  $\beta$ : standardized coefficient.

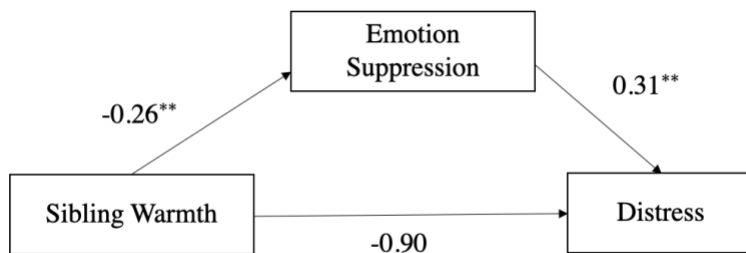
**Table 8.** *Regression Analysis Results for Resilience Outcome*

Step	Predictor	<i>B</i>	SE	$\beta$	<i>t</i>	<i>p</i>
1	Race	0.145	0.071	0.211	2.058	0.042
2	Race	0.156	0.063	0.226	2.473	0.015
	Optimism	0.083	0.017	0.453	4.953	0.000
3	Race	0.151	0.062	0.219	2.439	0.017
	Optimism	0.063	0.019	0.347	3.369	0.001
	Gratitude	0.039	0.019	0.215	2.091	0.039
Model 1	Adjusted R2 = .034, <i>p</i> < .05					
Model 2	Adjusted R2 = .232, <i>p</i> < .001					
Model 3	Adjusted R2 = .260, <i>p</i> < .001					

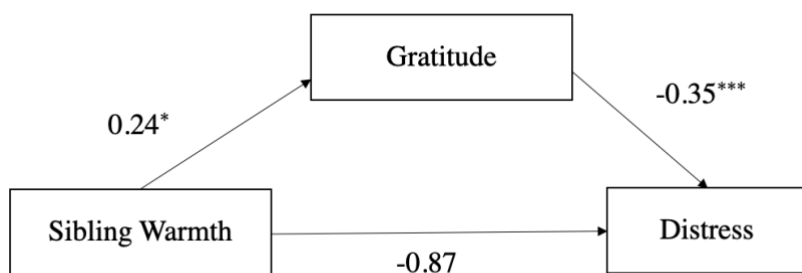
Notes: *B*: unstandardized coefficient. SE: standard error.  $\beta$ : standardized coefficient.

## Figures

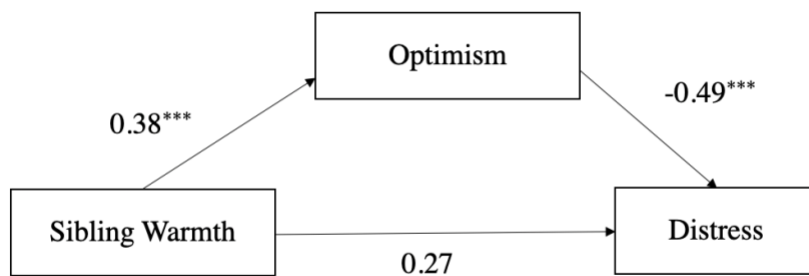
**Figure 1.** *Emotion Suppression Mediated the Association between Sibling Warmth and Distress*



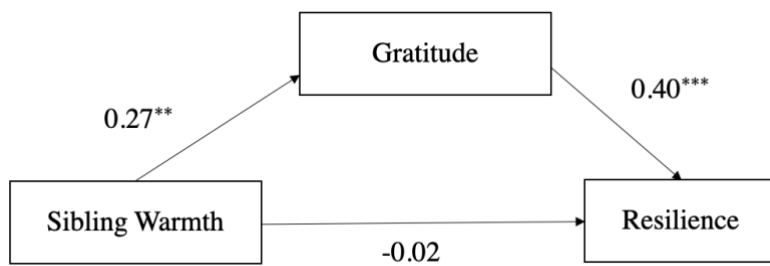
Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . a path refers to the effect of sibling warmth on emotion suppression; b path is the effect of emotion suppression on distress; c' is the direct effect of sibling warmth on distress.

**Figure 2.** *Gratitude Mediated the Association between Sibling Warmth and Distress*

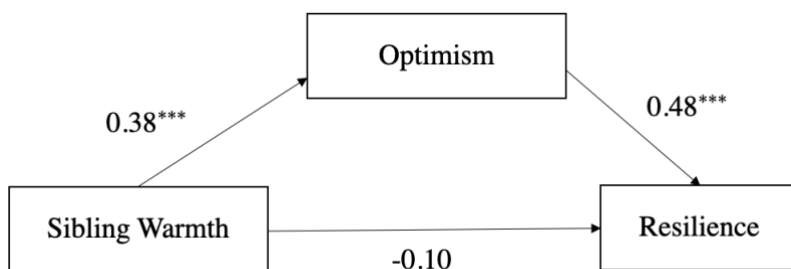
Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . a path refers to the effect of sibling warmth on gratitude; b path is the effect of gratitude on distress; c' is the direct effect of sibling warmth on distress.

**Figure 3.** *Optimism Mediated the Association between Sibling Warmth and Distress*

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . a path refers to the effect of sibling warmth on optimism; b path is the effect of optimism on distress; c' is the direct effect of sibling warmth on distress.

**Figure 4.** *Gratitude Mediated the Association between Sibling warmth and Resilience*

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . a path refers to the effect of sibling warmth on gratitude; b path is the effect of gratitude on resilience; c' is the direct effect of sibling warmth on resilience.

**Figure 5.** *Optimism Mediated the Association between Sibling warmth and Resilience*

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . a path refers to the effect of sibling warmth on optimism; b path is the effect of optimism on resilience; c' is the direct effect of sibling warmth on resilience.



*Appendix A**Consent Form*

## Information Sheet for Participation in a Research Study

Principal Investigator: Carolyn Shivers

IRB# and Title of Study: 20-655 College Sibling Survey

You are invited to participate in a research study. This form includes information about the study and contact information if you have any questions.

**Ø WHAT SHOULD I KNOW?**

If you decide to participate in this study, you will complete a survey. As part of the study, you will answer questions by clicking on the applicable button and/or typing in your response. These questions will ask about your sibling, your sibling relationship, how you handle stress, and how you feel about life in general.

The study should take approximately 20-30 minutes of your time.

The risk associated with this study is potential emotional discomfort from some of the questions.

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. Your choice to participate or not will not impact your grade or standing in any college class.

**Ø CONFIDENTIALITY**

We will do our best to protect the confidentiality of the information we gather from you, but we cannot guarantee 100% confidentiality.

Your responses are anonymous, so no one can associate your answers back to you. Please do not include your name or other identifying information in your responses that can identify you.

**Ø WHO CAN I TALK TO?**

If you have any questions or concerns about the research, please feel free to contact Dr. Carolyn Shivers at shivercm@vt.edu. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research participant, contact the Virginia Tech HRPP Office at 540-231-3732 (irb@vt.edu).

Please print out a copy of this information sheet for your records.

If you would like to participate in this survey, click yes to begin or no to exit.

*Appendix B**Demographics*

Your information.

Age: Please respond with only a number (e.g., "18" not "18 years old")

Gender: Woman; Man; Transgender Nonbinary; Gender nonconforming; Gender diverse; Other

Race: American Indian/ Alaska Native/ Asian/ Black or African American/ Hispanic or Latino/a/ Native Hawaiian or Other Pacific Islander/ White

What is your current year/level in college? Freshman/first year Sophomore/second year Junior/third year Senior/fourth year/Fifth year or higher (undergraduate)/ Graduate school - masters level/ Graduate school - doctoral level

What is your current major?

How would you describe your family's socioeconomic class? Lower class/Lower middle class/ Middle class/Upper middle class/ Upper class

Do you have a disability?

What type of disability do you have? Please check all that apply: Physical disability/Psychiatric disability/Mental illness/ Autism spectrum disorder/ Learning disability/Other (please describe)

Physical disability: Blindness/visual disability Deafness/hearing disability Motor disability/Chronic illness/Other (please describe)

Learning disability: ADHD/Dyslexia/Specific language impairment/ Language processing disorder/Nonverbal learning disorder/ Other (please describe)

Mental illness: Depression/Anxiety disorder/Eating disorder/Bipolar disorder/Other (please describe)

Sibling information

Please read the instructions carefully!

How many siblings do you have (please enter a whole number)?

Do you have any siblings with disabilities? This can be a physical disability, intellectual/developmental disability (like Down syndrome or autism spectrum disorder), learning disability (like ADHD or dyslexia), or psychiatric disability/mental illness (like depression or eating disorders.)? Yes/No

Please answer the "sibling" questions in this survey about your sibling with a disability. If you have more than one sibling with a disability, please answer the questions about the one who is closest in age to you.

Please answer the "sibling" questions in this survey about the sibling who is closest in age to you.

Sibling Age

What gender is your sibling? Woman; Man; Transgender Nonbinary; Gender nonconforming; Gender diverse; Other.

How are you and your sibling related? Full biological sibling (e.g., same biological parents); Half-sibling (e.g., share one biological parent) Step-sibling; Adopted sibling Foster sibling; Other (Please describe "other").

What type disability does your sibling have? Please check all that apply: Physical disability/Intellectual disability/ Autism spectrum disorder/ Psychiatric disability or Mental illness/Learning disability/Other (please describe)

To the best of your knowledge, was this disability diagnosed by a professional? Yes/No

Physical disability: Blindness/visual disability Deafness/hearing disability Motor disability/Chronic illness/Other (please describe)

Intellectual disability: Unspecified intellectual disability/ Down syndrome/Williams syndrome/Prader-willi syndrome /Other (please describe)

Learning disability: ADHD/Dyslexia/Specific language impairment/ Language processing disorder/Nonverbal learning disorder/ Other (please describe)

Psychiatric disability or Mental illness: Depression/Anxiety disorder/Eating disorder/Bipolar disorder/Other (please describe)

*Appendix C**Sibling relationship measurements*

The next two measures ask about your relationship with your identified sibling.

Please answer the following items about your identified sibling

not at all                      some                      a lot

How much do you go to this person for advice?                                                                 

How much does this person accept you no matter what you do?                                                                 

How much does this person understand what you're really like?                                                                 

How much do you share your inner feelings with this person?                                                                 

Hardly at all                      A little bit                      Some                      A lot                      Extremely much

How much do you and this sibling have in common?                                                                 

How much do you and this sibling talk about things that are important to each other?                                                                 

How much do you and this sibling thing of each other as good friends?                                                                 

How much do you and this sibling admire each other?                                                                 

How much do you and this sibling try to cheer each other up when one of you is feeling down?                                                                 

How much do you and this sibling go to each other for help with non-personal problems?                                                                 

How much do you and this sibling accept each other's personality?                                                                 

How much do you and this sibling know about each other?                                                                 

How much do you and this sibling have similar personalities?                                                                 

How much do you and this sibling discuss your feelings or personal issues with each other?                                                                 

How close do you and this sibling feel to each other?                                                                 

How much do you and this sibling think that the other has accomplished a great deal in life?                                                                 

How much can you and this sibling count on each other to be supportive when one of your is feeling stressed?                                                                 

How much do you and this sibling give each other practical advice?                                                                 

How much do you and this sibling accept each other's lifestyle?                                                                 

How much do you and this sibling know about each other's relationships?                                                                 

How much do you and this sibling think alike?                                                                 

How much do you and this sibling really understand each other?                                                                 

How much do you and this sibling let each other know you care about each other?                                                                 

How much do you and this sibling feel proud of each other?                                                                 

How much do you and this sibling discuss important personal decisions with each other?                                                                 

How likely is it you and this sibling would go to each other if you needed financial assistance?                                                                 

How much do you and this sibling accept each other's ideas?                                                                 

How much do you and this sibling know about each other's ideas?                                                                 

How much do you and this sibling lead similar lifestyles?

*Appendix D*

*Distress*

During the last 30 days, about how often did you... Never A little of the time Some of the time Most of the time

Feel so depressed that nothing could cheer you up?

Feel hopeless?

Feel restless or fidgety?

Feel that everything was an effort?

Feel worthless? Feel nervous?

*Appendix E**Gratitude*

*Please indicate how much you agree with each of the following statements.*

Strongly disagree   Disagree   Slightly disagree   Neutral   Slightly agree   Agree   Strongly  
agree

I have so much in life to be thankful for.

If I had to list everything that I felt grateful for, it would be a very long list.

When I look at the world, I don't see much to be grateful for.

I am grateful to a wide variety of people.

As I get older I find myself more able to appreciate the people, events, and situations that  
have been part of my life history.

Long amounts of time can go by before I feel grateful to something or someone.

*Appendix F*

*Optimism*

*Please answer the following questions about yourself.*

Strongly disagree   Disagree   Neutral   Agree   Strongly agree

In uncertain times, I usually expect the best.

It's easy for me to relax.

If something can go wrong for me, it will.

I'm always optimistic about my future.

I enjoy my friends a lot.

It's important for me to keep busy.

I hardly ever expect things to go my way.

I don't get upset too easily.

I rarely count on good things happening to me.

Overall, I expect more good things to happen to me than bad.

*Appendix G**Daily Emotion Regulation*

*We would like to ask you some questions about how you control (that is, regulate and manage) your emotions. Read each of the following statements carefully and indicate to what extent you engaged in the following behaviors today.*

Strongly disagree   Disagree   Somewhat disagree   Neutral   Somewhat agree   Agree

Strongly agree

When I wanted to feel more positive emotion (such as joy or amusement), I changed what I was thinking about.

I kept my emotions to myself.

When I wanted to feel less negative emotion (such as sadness or guilt), I changed what I was thinking about.

When I was feeling positive emotions, I was careful not to express them.

I controlled my emotions by not expressing them.

I controlled my emotions by changing the way I thought about the situation I was in.

When I was feeling negative emotions, I made sure not to express them.

When I wanted to feel less negative emotion, I changed the way I was thinking about the situation.



*Appendix H**Resilience*

*Please indicate the extent to which you agree with each of the following statements by using the following scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree*

I tend to bounce back quickly after hard times.

I have a hard time making it through stressful events.

It does not take me long to recover from a stressful event.

It is hard for me to snap back when something bad happens.

I usually come through difficult times with little trouble.

I tend to take a long time to get over set-backs in my life.