The Role of Interpersonal Problems in the Relationship Between Early Abuse Experiences and Adult Immune Functioning

Jonathan C. Waldron

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Angela Scarpa
George Clum
Jungmeen Kim-Spoon

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ABSTRACT

The current study aimed to test the long-term impact of abuse on immune functioning and to test the mediating role of interpersonal problems in the relationship between early child abuse experiences and immune functioning. A sample of 89 undergraduate adult women (*M age* = 19.24) completed reports of child abuse histories, interpersonal problems, and negative life events, and provided saliva samples to measure Secretory Immunoglobulin A (sIgA) and antibody level for Herpes Simplex Virus Type 1 (HSV-1-sIgA). Participants were divided into three abuse history groups (i.e., no history of abuse, child physical abuse, child sexual abuse). The results failed to support the proposed mediation models. Age and recent unwanted sexual experiences, but not childhood abuse, were associated with reduced sIgA levels. The non-abused group evidenced a higher proportion of participants with detectable HSV-1-sIgA compared to the child physical abuse and child sexual abuse groups. In those with detectable HSV-1-sIgA, both abuse groups appeared to have higher levels, but this needs to be tested in future research with larger sample sizes. These findings suggest that the impact of victimization on sIgA may be more short-lived, while child abuse may be associated with a greater HSV-1 recurrence from latency. Future studies should examine other psychosocial predictors of immune level differences.

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Chapter 1 - Introduction

Child abuse is a major concern in the United States and throughout the world. According to the Center for Disease Control and Prevention, Child Protective Services processed approximately 3.3 million reports of childhood abuse or neglect in 2008 (CDC, 2010). Abuse and neglect cause the deaths of 5.4 in every 100,000 children under the age of four (McClain, 1995). More disturbing than these numbers is the belief that abuse, especially sexual abuse, is highly underreported, since secrecy and threats are often employed to keep children quiet (Haugaard, 2000).

Children who experience abuse are at risk for short-term and long-term psychological, health problems and interpersonal deficits (Baladerian, 1991; Beitchman, Zucker, Hood, DaCosta, Akman, & Cassavia, 1992; Dube et al., 2003; Maniglio, 2009; Neumann, Houskamp, Pollock, & Briere, 1996). In particular, children who experience abuse will often exhibit disruptive behaviors, depression, low self-esteem, anxiety, aggression, sexual problems, substance abuse and symptoms of posttraumatic stress disorder (PTSD; DeBellis, 1997; Famularo, Kinscherff, & Fenton, 1992; Gorcey, Santiago, & McCall-Perez, 1986; Hubbard, Realmuto, Northwood, & Masten, 1995 Jumper, 1995; Neumann, Houskamp, Pollock, & Briere, 1996; Putnam, 2003 Rojas and Pappagallo, 2004). Abused children are also at a high risk for later revictimization in adulthood (Arata, 2000; Milletich, Kelley, Doane, & Pearson, 2010; Roodman & Clum, 2001; Tusher & Cook, 2010). The dangers and impacts of childhood abuse are something that should not be overlooked. This study specifically examined the link between interpersonal functioning as a mediator between child physical and sexual abuse and immune dysfunction in adult women.

1.1 Overview of the Immune System

The immune system consists of a series of cells and organs that protect the body against foreign invaders (antigens). The immune system works as a complex unit to keep invaders out, or destroy those antigens that get inside. The immune cells that protect the body are created in bone marrow. These cells react to cytokines (e.g., interleukins), or signals, which help to specify the specific type of immune cells. Some of these specific cells include T-cells (T-lymphocytes), B-cells (B-lymphocytes) and phagocytes. B-cells work to release antibodies, which are molecules that attack the antigens in the blood (Pinel, 2009).

Immunoglobulin A is part of a family of antibodies, which are found in the body's fluids and attack antigens. Secretory immunoglobulin A (sIgA) protects the mucosal surfaces and accumulates in such areas as saliva, tears, nasal fluids, sweat, milk, lungs and gastrointestinal tracts (Jenkins, 2004). SIgA is the dominant antibody in saliva and fights against antigens that enter through the mouth (Ogra, 1985). Most infectious diseases enter via the mucosal membranes, and deficiencies of sIgA are linked to a reduced level of protection for the body (Pacque, Booth, & Dwyer, 2002). SIgA will attach to these mucosal surfaces, thereby preventing bacterial entry into the body. This will in turn limit viral replication and aid in the elimination of illness. SIgA has been suggested to be a marker of overall health and is relatively easy to measure (Lawrence, 2002).

Another marker of immune functioning involves herpes simplex virus type 1 (HSV-1), which is a member of the herpes virus family. HSV-1 is a latent virus that usually resides in its dormant form in the trigeminal ganglia. Continually present though not necessarily active, HSV-1 appears as blisters around the mouth, called a cold sore, when triggered. HSV-1 cannot be cured, though a specific antibody does fight against the infection (HSV-1-sIgA). HSV-1 cannot be measured directly, so HSV-1-sIgA is used as an indicator of infection. It is estimated that around 20% of children are infected with HSV-1 (Tunback et al., 2003), mostly due to exposure to family members or other children. Further, it is estimated that around 60% are infected by adulthood (Xu et al., 2006). Xu and colleagues (2006) noted that the incidence of infections has decreased since the early 1990s. Not having the antibody typically means a person has not been infected with HSV-1, although one would also need to test the blood to be sure. The ability of the immune system to keep HSV-1 idle has been shown to be a good indicator of the impact of psychosocial factors on the immune response, in that greater psychosocial stress was related to a higher recurrence of the visible virus symptoms on the skin (Dalkvist, Wahlin, Bartsch, & Forsbeck, 1995; Glaser & Kiecolt-Glaser, 2005; Padgett, Sheridan, Dorne, Berntson, Candelora, & Glaser, 1998).

1.2 Explanatory Mechanism between Early Stress and Adult Health

The ability to regulate stress begins from birth and evolves over time. Taylor and colleagues (2004) noted the role of the amygdala in determining how we react to novel stimuli. Early on in life, we are unable to regulate the amygdala and will react to most unknown and stress producing experiences (e.g., a baby crying immediately to any loud noise). Eventually, we

mature in such a way that we can regulate our stress and emotional response more efficiently and effectively. Taylor and colleagues noted that it is through our social relationships that we learn to comfort ourselves. One must develop trust and a connection with another person in order to learn how to regulate reactions. We must develop social competence and interpersonal relations early on to help us deal with stress by ourselves.

Repetti and colleagues (2002) suggested that early life stress disrupts the development of social skills, which consequently are the same skills necessary to regulate stress later on in life. Cicchetti and Toth (2005) suggested that early damage to healthy attachments could also lead to lifelong social distrust. Not learning how to utilize others as teachers can lead to more negative reactions and the inability to handle pressure, including regulation of stress-related illnesses. Taylor and colleagues (2004) developed and tested a model that asserted that early experiences disrupt the ability to engage with others effectively. These early deficits lead to long-term physiological consequences that can affect health across the lifespan.

Their model is similar to the theory of allostatic load (McEwen, 2000). Allostasis is essentially the body's attempt to reach a sense of stability through physiological change (Sterling & Eyer, 1988). Since actual "homeostasis" is argued as impossible, allostasis was named to describe the more active and complex process. This change toward stability can occur through changes in the autonomic nervous system, neuroendocrine system or the immune system. Good stress means the allostatic response is working well. Allostatic load is defined as "the price the body pays for being forced to adapt to adverse psychosocial or physical situations, and it represents either the presence of too much stress or the inefficient operation of the stress hormone response system, which must be turned on and then turned off again after the stressful situation is over" (McEwen, 2000, pp.110-111). McEwen and Lasley (2002) suggested that allostatic load is like two extremely heavy people on a see-saw. While it may be in balance, the system is under strain that may soon break, which can lead to chronic conditions. This chronic over activation of certain systems leads to wear and tear. The vulnerability to allostatic load is influenced by early life experiences, which is a crucial time for developing the system necessary to regulate stress. If one is not able to learn how to handle stress early on, this could lead to unchangeable consequences in the biological stress regulation system. As the person faces more stress, including those brought on by social difficulties, they are less likely to go through a healthy life. Sapolsky (1995) suggested that when an organism is placed under acute stress,

immune cells will move to areas of the body to fight infection. If, however, the stress remains constant, that stress can result in health problems, including fat accumulations, insulin resistance, hypertension and a suppressed immune system.

Taylor and colleagues (2004) also noted that social competence mediates the relationship between harsh early experiences and long-term health related outcomes. They suggested that building social skills and social competence might help to mitigate some of the later health deficits. In their study, they suggested looking at biological and immunologic markers as a way to really examine the long-term health impact of early stress, rather than relying on participant self-report.

1.3 Abuse and Health

The link between stressful life events and health outcomes has been thoroughly examined in the literature. Selye (1956) was one of the first to suggest that stressful stimuli could lead to changes in the immune system. While stress itself does not cause infections, it does appear to lower the immune system's efficiency, creating a susceptibility to disease (Koh, 1998; Luecken et al., 1997). In a study examining workplace stress, for example, results indicated that nurses working in the emergency department experienced more immune deficits than general ward nurses (Yang et al., 2002). Stress-reduction techniques, can switch this effect, however, including increasing the number of T-cells.

When examining specific health and immunity changes, Phillips and colleagues (2006) found that stressful life events could lead to an increased risk for upper respiratory tract infections. The researchers noted a clear association between stress and low secretion rates of immunoglobulin A in saliva. These findings are consistent with the work by Hood, Weissman and Wood (1978), which also showed a negative association between stressful life events and immunoglobulin A. Similar results were found in a meta-analysis by Herbert and Cohen (1993), who noted that stress is negatively related to sIgA (r=-.144; $p < .01$).

The health deficits associated with abuse, a major stressor, are therefore not surprising. Clark, Thatcher and Martin (2010) found that child abuse predicted elevated health-related symptoms, including those associated with urination, eating habits, and oral health. Lanier and colleagues (2010) noted that maltreated children had a 74-100% higher risk for health care usage for such illnesses as asthma, cardio-respiratory and non-sexually transmitted infections. In addition, they found that continual maltreatment predicted a higher number of hospital visits.

These findings of higher medical care usage have been replicated in other studies (Arnold, Rogers, & Cook, 1990). In addition, the number of school absences is much higher among sexually abused girls, although the exact reasons are not known (Trickett, McBride-Change, & Putnam, 1994). Furthermore, Putnam and Trickett (2006) noted that mother-reported rates of colds, flu, and other minor illnesses were disproportionately greater in abused compared to non-abused girls.

In a meta-analysis, 31 adults who were abused as children were 1.35-2.12 times more likely to endorse negative health outcomes associated with general health, gastrointestinal health, gynecologic or reproductive health, pain, cardiopulmonary symptoms and obesity when compared to non-abused peers (Irish, Kobayahi, & Delahanty, 2010). The researchers suggested that sexual abuse is associated with frequent and/or more long-term physical health outcomes across several different domains (Teicher, 2002; Teicher et al., 2003). Chartier, Walker and Naimark (2007) found several health related problems associated with child physical and sexual abuse. Those with a history of child physical abuse were 1.39 times more likely to report multiple health problems, 1.41 times more likely to report poor self-rated health, and 1.85 times more likely to report high emergency room usage when compared to non-abused peers, even after controlling for age, sex, low income and marital status. Those with a history of child sexual abuse were 1.70 times more likely to report multiple health problems, 1.55 times more likely to report poor self-rated health, and 1.79 times more likely to report high emergency room usage when compared to non-abused peers, controlling for the same variables. Of note, females and younger participants tended to have higher odds ratios.

Relevant to the effect on immune functioning, several studies have examined the effects of abuse on specific antibodies. In a study examining the relationship between physically and psychologically abused adult women and HSV-1, Garcia-Linares, Sanchez-Lorente, Coe and Martinez (2004) found a negative effect on immune responses related to HSV-1 infections. They noted a huge reduction in the viral neutralizing capacity of saliva of abused women, with some women evidencing a complete absence of antiviral activity (i.e., 75% of physically abused women).

Women with a history of early life stress (i.e., child sexual abuse) have not only exhibited higher concentrations of the stress hormone cortisol, but surprisingly interleukin-6, a proinflammatory cytokine that plays a role in the non-specific immunity of patients (Nunes,

Watanabe, Morimoto, Moriya, & Reicher, 2010). While seemingly opposing most theories, increased levels of interleukin-6 have been found in cancer patients (ASCO, 2006). These findings have since been theorized to explain depression often seen in these populations, with interleukin-6 playing a key role in symptomatology. The authors suggest that interluekin-6 influences sickness behavior and stress, which tends to overlap with symptoms of major depression. Another surprising finding was a link between early childhood stress, including those with a history of physical abuse, and elevated antibody levels to HSV-1 in adolescents (Shirtcliff, Coe, & Pollak, 2009). The researchers believed that the elevated antibody levels were indicative of viral emergence from latency. That is, the antibody was constantly being produced to limit the reappearance of the disease, but continually failed. Therefore, this indicated a persistent effect of early experiences on immune functioning well into adulthood. The authors believed that early events are "critical for creating healthy foundation upon which both emotional and physical wellbeing is established" (Shirtcliff, Coe, & Pollak, 2009, p. 2965).

1.4 Abuse and Interpersonal Deficits

The idea that children who have been sexually or physically abused would exhibit interpersonal difficulties later in life is understandable. Exposure to any form of trauma will have a negative effect on interpersonal functioning (Beck, Grant, Clapp, & Palyo, 2009). Early social attachments are linked with later social relationship development, while poor social attachments are linked to poor adult attachments (Rutter, 1989). Cicchetti and Toth (2005) noted that early maltreatment can damage healthy attachments, social processing, and emotional learning. This in turn could lead to social disruption throughout the lifespan. Rich and colleagues (2005) noted that interpersonal problems emerged both as an aftereffect of adolescent sexual victimization and as a predictor of subsequent sexual victimization. That is, child and adolescent sexual abuse predicted later interpersonal problems, which then predicted revictimization.

In particular, women sexually abused in childhood will likely have poorer social and sexual relationships when compared to non-abused peers (Jackson, Calhoun, Amick, Maddever, & Habif, 1990; Watkins & Bentovim, 1992). Patients who experienced childhood sexual abuse often report more interpersonal conflicts (Kernhof, Kaufhold, & Grabhorn, 2008). Specifically, researchers found that when compared to a control group, women who experienced child sexual abuse reported a higher occurrence of interpersonal problems both in terms of the Inventory of

Interpersonal Problems overall score and the majority of the individual subscales. The women who reported sexual abuse described themselves as more introverted, manipulated and exploitable.

Furthermore, child sexual abuse interferes with the development of complex and integrated self-organization and self-regulation, as well as self-esteem, interpersonal competency and general sense of safety in a very interpersonal world (Briere & Elliott, 1997; Cole & Putnam, 1992). Child sexual abuse disrupts the ability to generate realistic appraisals of self and others, leading to an inability to form an accurate and whole image of self and others (Callahan & Hilsenroth, 2005).

Briere and Rickards (2007) found that child sexual abuse significantly predicted a significantly altered self-identity and relatedness issues, pertaining to increased idealization-disillusionment, abandonment concerns, susceptibility to influence and affect dysregulation. Moreover, there is a link between early abuse and deficient romantic relationship formation, caused by a fear and distrust of men as well as difficulty with sexual functioning (Gorcey, Santiago, & McCall-Perez, 1986).

1.5 Interpersonal Deficits and Health

Prior research has demonstrated links between psychosocial factors and health, including specific immune disruptions. Solomon, Kemeny, and Temoshok (1991), in a study of HIV infected men, noted that those who were more assertive, had less emotional distress, and more self-nurturing behaviors evidenced a higher number of natural killer lymphocytes. Goodkin, Fuchs, Feaster, Leeka, and Rishel (1992) noted relationships between life stress, social stress, and passivity and lower lymphocytes levels. Socially, those who fear social isolation or are stigmatized repeatedly may experience an increase of health difficulties (Sapolsky, 2004).

Research also suggests that unhealthy environments can lead to negative health outcomes. Unhealthy environments are defined as those that threaten safety, undermine the creation of social ties, and are conflictual, abusive or violent (Taylor, Repetti, & Seeman, 1997). Miller, Rohleder and Cole (2009) found that interpersonal deficits were associated with a risk for respiratory infections, delayed healing of wounds, and mortality from cardiovascular disease. Some interpersonal traits, such as submissive attitudes and lower empathic concerns for self and others, have been associated with certain negative health outcomes (Smith, 2006; Smith,

Traupman, Uchino & Berg, 2010). In addition, chronic anger/hostility and neuroticism/negative affectivity, which can impact interpersonal relationships, have been established as the best interpersonal risk factors for poor health (Smith, 2006).

Brenders (1989) found that people who had more feelings of control tend to have more positive interpersonal interactions, which in turn led to better outcomes in the health setting, while those who felt the least amount of control had the worse outcomes. In addition, people who evidenced more submissive traits and have fewer interpersonal connections have negative health outcomes. Dominant baboon males have been noted to have greater lymphocyte counts (Sapolsky, 1993), suggesting that those with more interpersonal dominance are healthier. McEwen and Seeman (1999) further suggested that being socially inept and "weaker" animals, including humans, encourages disease. Padgett and colleagues (1998) noted that in mice, social stress was related to a higher recurrence rate of HSV-1.

The support of family and friends has long been linked with a healthy life. Ruiz and colleagues (2006) noted in their literature review that a healthy marriage is associated with a lower risk of cardiovascular morbidity and mortality in general. This was only true, however, when the relationship was viewed as being supportive.

Kiecolt-Glaser and colleagues (1987) compared married women to separated or divorced women and found that disrupted marriages are often associated with poorer responses on functional immunologic assays. Furthermore, relational conflict and lower social support can affect proinflammatory cytokine secretion, which aids in the immune response (Kiecolt-Glaser, Gouin, & Hantsoo, 2010). Divorce or death can also exhaust the immune system. Lonely students evidenced different immune functioning when compared to those who were fulfilled by their social ties (Kiecolt-Glaser, 1999). Cohen and Wills (1985) described the protective benefits of companionship and social support. The evidence suggests that several interpersonal factors are involved in healthy lifestyle.

1.6 The Proposed Study

Collectively, previous research provides a strong argument for the hypothesis of a link between early victimization and health outcomes. Furthermore, there is a link between early victimization and psychosocial variables, including interpersonal deficits. Additionally, there is a relationship between interpersonal deficits and health consequences. However, few studies have examined long-term health problems and immune system dysfunctions associated with

child abuse. In the few that have, other psychosocial mediators, such as depression and socioeconomic status, have been explored as explanatory mechanisms between early history and adult health functioning. Moreover, previous research has largely focused on general health reports and not necessarily specific, quantifiable immune differences. Another gap involves the focus on short-term immune differences, and less is known about chronic long-term effects. The current study will contribute to the literature by assessing the long-term effects of multiple forms of child maltreatment. The goal of this study is to assess the role of different types of abuse (physical and sexual) as a risk for group differences in specific immunologic responses (i.e., sIgA and HSV-1-sIgA). Interpersonal problems will be examined as a potential mediating factor in this relationship. Considering the findings of Taylor and colleagues (2004), early abuse may disrupt the development of interpersonal skills and create more interpersonal problems. These interpersonal problems may continually limit the ability to handle life experiences, leading to stress and detrimental health outcomes. The relationships between the constructs of interest could serve as later risk factor for health problems associated with early abuse experiences.

Chapter 2 - Hypotheses

It is hypothesized that early childhood sexual and/or physical abuse will have an impact on adult immune functioning. Specifically, adults with a history of child abuse will have a compromised immune system, as evidenced by lower Total sIgA levels. Further, those with a history of child abuse will also have higher levels of HSV-1-sIgA, since it is assumed the body is continually trying to fight the HSV-1 infection. The effects of child physical abuse or child sexual abuse (with or without physical abuse experiences) relative to a control group with no abuse experiences will be examined. Recent stressful life events and unwanted sexual experiences could potentially confound the results (Classen at al., 2002) and will therefore be statistically controlled if they are found to be correlated to the variables of interest.

Further, it is expected that interpersonal problems will mediate the relationship between early childhood abuse and adult immune functioning. That is, childhood abuse will predict increased interpersonal problems in adulthood, which will in turn be associated with greater current immune deficiencies. If these results are found, it would emphasize the influence of interpersonal deficits in experiencing immune disruptions consequent to early abuse.

Chapter 3 - Methods

3.1 Participants

The proposed study was approved by the Institutional Review Board of Virginia Tech, as well as the Psychology Department Human Subjects Committee. The total sample included 89 female college students between the ages of 18 and 23 (M = 19.24, SD = 1.29), recruited through the undergraduate psychology pool at Virginia Tech. The final sample consisted of 66 Caucasian women (74.2%), 10 Asian women (11.2%), 5 African-American women (5.6%), 5 Hispanic women (5.6%), and 3 women who identified themselves as Other (3.4%). The majority of participants were full-time students (97.8%), heterosexual (97.8%), single (69.7%), currently living in an area consisting of the middle class (62.9%), originally from an area consisting of the upper middle class and professionals (43.8%), and with family income between $100,000 to $199,999 (34.8%). See Tables 1 and 2 for a more complete list of the descriptive statistics.

This should be a sufficient sample size (power of above .80) to detect a medium size effect for group differences using the G-Power Program (Faul, Erdfelder, Lang, & Buchner, 2007). Women were used due to the higher rates of sexual abuse and comparable rates of physical abuse when compared to males (Briere & Elliott, 2003). Specifically, Pereda, Guilera, Forns, and Gomez-Benito (2009) noted in a meta-analysis that 19.7% of women had experienced child abuse compared to 7.9% of men. Chartier and colleagues (2007) noted a higher rate of health care utilizations in women with a history of child abuse compared to men. In addition, women tend to view interpersonal relations as relatively more important than males (Tamares, Janicki, & Helgeson, 2002). Jafarzadeh, Sadeghi, Karam, and Vazirinejad (2010) noted that women and men had very similar sIgA levels, suggesting no gender differences. College women were deemed as an appropriate population to focus on because previous studies suggest that college students may be at a greater risk of sexual victimization than non-college women. Studies suggest around 50% of female college students reported sexual victimization while around 25% reported experiencing attempted or completed rape (Abbey et al., 2001; Crowell & Burgess, 1996; Koss, 1988; Spitzberg, 1999). In terms of victimization histories in the current sample, 41 reported no physical or sexual victimization prior to the age of 14 (46.1%), 25 reported physical abuse prior to age 14 (28.1%), and 23 reported sexual abuse prior to age 14 (25.8%).

The women were recruited through flyers posted on campus, verbal announcements in classes, and the Virginia Tech SONA Experiment Management System. Participants who were eligible for Phase II – Lab of the study were contacted directly and privately through email and provided with a password. This allowed the participants to sign up for timeslots, which was also made available through the Virginia Tech SONA Experiment Management System.

Participants received extra credit towards any instructor-approved psychology course if they participated in Phase I - Screening. If eligible for Phase II – Lab, participants received an additional extra credit point towards any instructor-approved psychology course and $10 upon completion of the tasks and return of the samples. Participants were allowed to withdraw from the study at any point in time with no consequence.

3.2 Phase I - Screening

Demographic Questionnaire (Appendix A). This questionnaire involved questions about the participants' background, such as age, gender, race, sexual orientation and socioeconomic status. Only women between the ages of 18 and 25 were invited to be included in the current study. This information was gathered to examine any interesting associations between early abuse experiences and backgrounds to be used as potential covariates. Identifying information was stored separately from the questionnaire responses to protect the participants' confidentiality, especially considering the sensitive questions asked.

Medical History Questionnaire (Appendix B). This self-report questionnaire was used to screen for significant medical or health problems that may interfere with Phase-II and the immune measures. That is, any significant illness or recent sickness that may serve as confounds in the lab portion of the study. The questionnaire included several questions that were used for the larger study (e.g., exercise), but were not included in analyses since they were not pertinent to the research questions.

Child Abuse Survey-Modified (CAS; Esposito & Clum, 2002; Appendix C). Participants completed the Child Abuse Survey-Modified as a retrospective measure of child sexual and physical abuse that occurred before the age of 14. This 14-item instrument was adapted from the Child Maltreatment Survey (Yang & Clum, 1994) that assesses sexual (seven items) and physical (seven items) abuse incidents by asking the participants to rate each of the items on the following scale: 0 = never true, 1 = rarely true, 2 = sometimes true, 3 = often true,

and 4 = very often true. A participant's positive endorsement of any item on the CAS was sufficient for laboratory phase eligibility. In the current samples, the CAS evidenced adequate internal validity (.91).

The first seven items asked about child sexual abuse experiences, where child sexual abuse was defined as a sexual act involving bodily contact by someone who is at least five years older than the child. The items include: (1) kissing and hugging in a sexual way; (2) touching body parts (except for sex organs) in a sexual way; (3) touching sex organs in a sexual way; (4) inserting sex organs in one's mouth; (5) having sexual intercourse; (6) having anal intercourse; and, (7) receiving threats of harm or defamation.

The next seven items asked about child physical abuse experiences, specifically pertaining to injuries that required (regardless if actually received) medical treatment and only those that occurred by a caregiver. The items asks questions concerning: (1) being hit; (2) being kicked; (3) being punched; (4) being thrown down; (5); being stabbed; (6) being punished with a solid object; and, (7) experiencing another physical act.

The definition of child abuse offered here is consistent with guidelines cited by the Child Welfare Information Gateway (2008). That is, child abuse is "at minimum any recent act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation or an act or failure to act which presents an imminent risk of harm" (Child Welfare Information Gateway, 2008, p. 2). Specifically, "physical abuse is nonaccidental physical injury as a result of punching, beating, kicking, biting, shaking, throwing, stabbing, choking, hitting, burning, or otherwise harming a child that is inflicted by a parent, caregiver, or other person who has responsibility for the child" (Child Welfare Information Gateway, 2008, p. 2). "Sexual abuse includes activities by a parent or caregiver such as fondling a child's genitals, penetration, incest, rape, sodomy, indecent exposure, and exploitation through prostitution or the production of pornographic materials (Child Welfare Information Gateway, 2008, p. 3).

Using the participants' responses to the CAS, the women were categorized into one of the following victimization groups: no victimization, physical abuse (CPA), or sexual abuse (CSA). Participants were identified as having no victimization history if they failed to report any incidents of sexual or physical abuse prior to the age of 14 (41; 46.1% of the current sample). Participants were identified with a history of physical abuse prior to the age of 14 if they

endorsed at least one incident of physical abuse and no incidents of sexual abuse (25; 28.1% of the current sample). Women were identified as survivors of sexual abuse prior to the age of 14 if they endorsed at least one sexual victimization event, regardless of physical abuse history (23; 25.8% of the current sample). This decision was made because sexual abuse events can involve aspects of physical violence. For example, physical force may be used during the perpetration of sexual victimization.

Inventory of Interpersonal Problems (IIP; Pilkonis, Kim, Proietti, & Barkham, 1996; Appendix D). This questionnaire consists of 47-items that measure common interpersonal problems that the respondent may have experienced. The participants were asked to rate how characteristic each item is of them from 0 (not at all) to 4 (extremely). The questionnaire has been validated with a non-clinical college sample (Scarpa et al., 1999), demonstrating high internal consistency ($\alpha = .90$), strong test-retest reliability and good convergent and external validity.

The IIP items are presented as either forms of inhibitions or excesses. For example, an inhibition question includes "It is hard for me to really care about other people's problems," while an excesses question includes "I try to please other people too much." Items on the scale are summed to obtain an overall interpersonal problems score, with higher scores indicating greater interpersonal deficiencies.

As seen in Table 1, the Cronbach's alpha for the current study is .96, suggesting the scale had adequate internal consistency.

Life Events Checklist - Modified (LEC; Johnson & McCutcheon, 1980; Appendix E). This questionnaire consists of 45 self-report items that assesses for recent and past life experiences. Questions are asked on the amount of impact the event had on the participant's life ("no effect," some effect," "moderate effect," or "great effect"). The original measure has been modified to assess for only negative life events. If the participants experienced, but did not perceive the events as being negative, they were instructed to select N/A. This measure was used to control for recent and other life experiences that could confound the immune levels (Classen et al., 2002). As show in Table 1, the Cronbach's alpha for the current study is .90, suggesting the scale had adequate internal consistency.

3.3 Phase II – Laboratory Tasks

Self-Report Measures

Sexual Experiences Survey (SES; Koss & Gidycz, 1985; Appendix F). The participants completed the Sexual Experience Survey at the beginning of the laboratory potion. The survey consists of 10 self-report questions using a "yes-no" format in terms of unwanted sexual experiences that may have occurred since the participants turned 18-years-old. Scores were calculated by summing the ten items. Prior research supports good psychometric characteristics for the including adequate internal consistency (.74 for women) and test-retest reliability (93% agreement; Koss & Gidycz, 1985). This measure was used to control for recent sexual events that may confound the immune levels (Classen et al., 2002). As seen in Table 1, the Cronbach's alpha for the current study is .70.

Immune Measures

Secretory Immunoglobulin A (sIgA). SIgA has been used in several studies due to the ease of saliva collection. It is also relatively stable (Pacque, Booth, & Dwyer, 2002) with a half-life of 3-6 days (Koh & Koh, 2007). It can survive storage in a home freezer for a short amount of time before it needs to be moved to an ultracold freezer before analysis (Garcia-Linares, Sanchez-Lorente, Coe, & Martinez, 2004). SIgA is usually reported as (μg/min) defined as concentration of sIgA in saliva (μg/ml) multiplied by saliva flow rate (ml/min), instead of just concentration alone (Koh & Koh, 2007). High levels of stress have been linked to low sIgA rates in several different studies (Koh & Koh, 2007; Yang et al., 2002).

Frozen specimens were sent for analysis to the laboratory of Dr. Christopher Coe, at the University of Wisconsin at Madison. Dr. Coe has developed several unique assays to quantify antibody in saliva, and thus to non-invasively evaluate immune status. Briefly, sterilized saliva was generated for each woman by combining equal 2 ml aliquots from the different times (Garcia-Linares, Sanchex-Lorente, Coe, & Martinez, 2004). In turn, the saliva was diluted 1:1 with phosphate buffered saline and passed through a sterilzing millipire filter (0.45 μm; Gelman Sciences, Ann Arbor, MI). These steps created samples of particulate-free saliva of similar viscosity for each woman. Total sIgA level concentrations were quantified from these samples. Total sIgA levels were quantified by enzyme-linked immunosorbent assay (ELISA) using a commercial kit (Salimetrics, State College, PA) (see Watamura et al., 2010 for additional

methodological details). SIgA can be caluclated by taking the average of the four samples collected across two days.

Herpes Simple Virus Type 1 Specific Antibody (HSV-1-sIgA). HSV-1-sIgA has been used in several studies and is considered a good biomarker of the relationship between stress and immune functioning (Glaser & Kiecolt-Glaser, 2005). As stated above, frozen specimens were sent for analyses by Dr. Christopher Coe at the Univerity of Wisconsin at Madison. The same steps were used to create clean saliva samples. From the samples created, HSV-1-sIgA levels can be quantified rather easily. Specific salivary antibody against HSV was determined by ELISA, modified from procedures described previously by Zhang (1993). Briefly, as described by Sanchez-Lorente, Blasco-Ros, Coe and Martinez (2010), HSV-1-sIgA levels are quantified by enzyme-linked immunosorbent assays. Microtiter plates are coated with HSV-1 (inactivated strain F, ATCC) which will bind HSV-1 antibody in the saliva (WLII HSV-1 ELISA, Alere 425400CE, Princeton, NJ). The bound complex reacts with goat antihuman sIgA. Alkaline phosphatase substrate (Sigma St. Louis, MO) was added and color reaction was stopped after 30 minutes with sodium hydroxide and then read on a Dynatech plate reader at 405 nm. For an example of prior results, see Shirtcliff and colleagues (2009). HSV-1-sIgA can be calculated by taking the average across two days. It is important to note that at times, participants do not have detectable antibody to HSV in their saliva. If the average across two days is greater than 0.1, then a person is considered to have detectable HSV-1-sIgA.

3.4 Procedures

This study was conducted as part of a larger study examining different psychology, physiological and immunological variables associated with child and adult abuse. The current study included two phases. Phase I - Screening involved screening instruments administered through the Virginia Tech SONA Experiment Management System. The instruments included the Informed Consent Form I (Appendix H), Demographics Questionnaire, Medical History Questionnaire, CAS, IIP, and LEC. The LEC was used to control for any potentially stressful life events that could confound the immune measure. There were other measures that were collected at that time, but are not listed here since they are not relevant to this specific study. The online portion lasted between 45 and 60 minutes. In total, 1,066 participants completed Phase I. Of the 1,066, 64.5% were non-abused, 23.0% experienced CPA, 7.8% experienced CSA, and 4.7% did not provide sufficient information to determine abuse history. Participants

who met the eligibility requirements for Phase II - Lab were contacted directly via email by the researcher. In total, 89 participants accepted the invitation and returned all saliva samples during Phase II. Further, of all participants with no history of abuse, 6.0% participated in Phase II - Lab, 10.2% of those with a history of CPA participated, and 27.7% of those with a history of CSA participated. In terms of victimization histories of those 977 who did not participate, 69.8% were not abused, 23.7% experienced CPA, 6.5% experienced CSA, and 5.1% did not provide sufficient information to determine abuse history. Independent sample t-tests were conducted to explore differences between the 89 who participated and those who did not. T-tests revealed that those who participated had significantly higher IIP sores, $M = 1.97$, $SD = .12$, compared to non-participants, $M = 1.95$, $SD = .11$; $t\ (918) = -2.07$, $p = .04$ and higher LEC scores, $M = 1.79$, $SD = .09$, compared to non-participants in the larger screening sample, $M = 1.76$, $SD = .09$; $t\ (921) = -2.53$, $p = .01$.

Those who participated in Phase II showed no differences or associations from those who did not participate on age, recent illness, ethnicity, student status, sexual orientation, relationship status, socioeconomic status from current or original location, and income.

When arriving at the laboratory, a female research assistant greeted the participants. After reviewing and agreeing to the informed consent (Informed Consent Form II; Appendix I), the research assistant asked the participants if they wished to complete any questions they left blank from the Phase I - Screening. The participant, however, was not required to complete anything she wished not to answer.

Next, the participants completed the Sexual Experiences Survey. Additional tasks from the larger study were completed during Phase II – Lab before instructions on saliva collections were given. As recommended by Garcia-Linares, Sanchez-Lorente, Coe and Martinez (2004), saliva samples were collected on two consecutive days, once in the morning (between 8 a.m. and 9 a.m.) and again at night (between 8 p.m. and 9 p.m.), to get an adequate sample. Samples were averaged across the two mornings and across the two evenings, and a total average was generated. The participant was taught how to collect saliva in small plastic tubes, which she took home. She was provided with written instructions as a reminder. The volume and the time duration to collect the saliva were recorded, which helped to eliminate major group differences in main flow rate (ml/min). We provided necessary materials for storage of the samples. Specifically, participants were provided with a large Styrofoam cooler, an ice pack, a small

container with compartments to store the vials, 4 cryovials (2 ml), a plastic bag, 4 straws and 4 pieces of sugar-free plain gum. The vials were stored in the small container and the container was sealed inside plastic bags while in the freezer. The participants returned the samples to us after collection in the larger Styrofoam box with an ice pack, so the samples did not thaw in transport. This ensured that the samples were not in the home freezer for more than two days. Upon our lab's receipt of the vials, they were stored in an ultracold freezer before being shipped to Dr. Christoper Coe, where they were once again stored in an ultracold freezer. As stated above, sIgA and HSV-1-sIgA are relatively stable and can tolerate some fluctuation in freezer temperature; therefore, our team was confident that the antibodies could tolerate a period of time in a standard freezer before it went into an ultracold freezer. This is considered a non-invasive procedure and this technique has been used in studies by our lab as well as other investigators and Dr. Coe's lab with no adverse effects.

Following the tasks, the participants were debriefed to ensure they were not distressed by the procedures. The participants had the opportunity to ask any questions and to voice if they had any concerns about any of the tasks, including those from the larger study. A list of local psychological and medical resources were made available for each participant (Appendix G).

The Phase II - Lab experimental session lasted between 45 minutes and one hour. Upon receipt of all samples, the participant was offered extra credit for a psychology class, if applicable, and $10.

Chapter 4 - Analytic Plan

4.1 Preliminary Analysis

The data were examined for assumptions of normality, linearity, and homoscedasticity. Means, standard deviations, and actual and possible ranges were calculated for all variables of interest. Further, inter-correlations were examined between all of the variables of interest, specifically to determine whether it was necessary to enter any covariates into the primary analyses. For example, the effects of the subjects' age were initially examined by conducting Pearson-product moment correlations. Variables with relationships among immune measures were statistically controlled for in analyses.

4.2 Missing Data

Every possible measure was taken to prevent incomplete data. If any items were left incomplete during the online portion of the study or during the laboratory session, the research assistants inquired whether the participant left the item(s) blank intentionally or accidentally. Of course, participants were never required to answer any questions. These checks were simply done to maximize the completeness of the data. As will be discussed in a later section, there were no missing data and therefore no supplemental steps were taken to address missing data during analyses.

4.3 Hypothesis Testing

First, one-way Analysis of Variance (ANOVA) was conducted to compare the three groups on total sIgA in order to test the hypothesis that childhood abuse impacts overall immune functioning. Then, a simple regression was conducted in order to test the mediation hypotheses (MacKinnon, Fairchild, & Fritz, 2007). For mediation to be supported, the analyses should demonstrate a relationship between the independent variable (childhood abuse experiences) and the mediator (adult interpersonal problems), as well as between the mediator and the dependent variable (sIgA). If the relationships between one or more of these variables were not significant, then a mediation was not likely.

First, since type of abuse is a categorical predictor, these variables were dummy coded, as suggested by Cohen, Cohen, West and Aiken (2003) and Aiken and West (1991). Since there are three victimization groups (child physical abuse, child sexual abuse, none), two coded variables were needed. Participants in the non-abused group served as the reference group (i.e.,

coded as 0 for both codes). Child sexual abuse was coded as 1 for the first code (CPA = 0, CSA = 1, None = 0) and child physical abuse was coded as 1 for the second code (CPA = 1, CSA = 0, None = 0).

In order to test the mediation, a regression was conducted. Initially, the abuse dummy codes were entered as the independent variables. Age and the SES were included in the primary analyses as covariates. Then, the IIP scale was included, after controlling for other variables. The data should suggest that a relationship exists between immune system functioning and interpersonal problems. After these steps, immune system functioning will be regressed on abuse and interpersonal styles. A mediation would be indicated if the existing relationship between abuse type and immune system functioning decreases or is eliminated.

Confirmation of mediation will be established via MEDIATE (Hayes & Preacher, 2012). This program produces various omnibus tests of total, direct and indirect effects of variables. MEDIATE produces an omnibus test for the relationship between the independent variables (i.e., abuse type) and the dependent variable (i.e., sIgA level). In addition, it produces omnibus tests for the mediator in the model (i.e., IIP). Covariates (i.e., age and SES) were also included in the model. MEDIATE produces a bootstrap confidence interval for indirect effects (Shrout and Bolger, 2002). Bootstrapping involves the creation of confidence intervals to test for statistical significance of indirect effects. The steps involved include showing a significant correlation between the predictor of child abuse and the dependent variable of immune functioning (i.e., c path). Child abuse should account for a significant proportion of the variance in the mediating variable, interpersonal problems (i.e., a Path). Interpersonal problems should also account for a significant proportion of the variance in immune functioning (i.e., b Path). After creating the confidence interval, if the indirect effect (i.e., a x b) does not include zero, one can conclude that the indirect effect of sexual abuse experiences on immune function through the mediator of interpersonal problems is statistically significant at the .05 level.

To explore the relationship between abuse history and HSV-1-sIgA, Chi-square analyses were run. Specifically, participants were determined to either have detectable HSV-1-sIgA (i.e., average across two days is greater than 0.1), or to have undetectable HSV antibody (i.e., average across two days is less than 0.1). HSV-1-sIgA was coded as 1 if it was detectable, and 0 if it was not. Pearson's chi-squared tests were run to determine if there were significant associations between abuse group and the detection of HSV-1-sIgA.

To further explore any significant findings on HSV-1-sIga, logistic regressions were run to examine if CPA or CSA were significant predictors of having detectable HSV-1-sIgA. The same dummy codes described earlier were used.

Chapter 5 - Results

5.1 Preliminary Analysis

Descriptives and zero-order correlations are provided in Tables 1 and 3 respectively. The following variables were found to be positively skewed: Total sIgA, IIP, SES, and LEC. Log transformations were used to normalize these distributions. As such, the transformed values were used for all of the analyses that follow. Age of participants ($r = .316$, $p < .01$) was significantly positively correlated with Total sIgA and was therefore included as a covariate. LEC ($r = .305$, $p < .01$) was significantly positively correlated with IIP and SES ($r = .260$, $p < .05$). SES was negatively related to sIgA ($r = -.162$, $p < .05$). No other significant correlations were found.

As stated above, only participants who completed all parts of Phase II - Lab were included in the analyses. A potential confound for immune functioning was an indication of recent illness. Recent illness can affect sIgA levels, typically resulting in a decrease. However, a question asking about recent illness or sickness on the Medical History Questionnaire was not related to the variables of interest, and was therefore not included in the analyses.

A one-way between-groups analysis of variance was conducted to explore the impact of child abuse on the LEC. Results failed to indicate a significant difference between groups on the LEC as determined by one-way ANOVA ($F(2,86) = 0.840$, $p=.44$). Since the LEC was not associated with abuse histories or sIgA, it was not included as a covariate.

A one-way between-groups analysis of variance was conducted to explore the impact of child abuse on the Sexual Experiences Survey; results indicated a significant difference between groups, $F(2,86) = 9.370$, $p<.01$. A Tukey post-hoc test revealed that SES was significantly higher for the CSA group compared to the non-abused group. The CPA group did not differ significantly from either the non-abused ($p = .07$), or the CSA ($p = .14$), groups. Child abuse scale means and standard deviations are presented in Table 4.

A paired-samples t-test was conducted to evaluate sIgA across the two days of data collection. The morning and evening samples from Day 1 were averaged and compared to the average of the morning and evening samples from Day 2. T-tests revealed no signficant differences from Day 1, $M = 2.16$, $SD = .30$, and Day 2, $M = 2.17$, $SD = .31$; $t(88) = -0.52$, $p = .61$, suggesting that sIgA is reliable and stable in the present study.

Of the 89 participants who completed Phase II, all were included in the following analyses. Complete data were available for 89 all participants; therefore, no additional analytical steps were necessary to deal with missing data.

5.2 Secretory Immunoglobulin A

Impact of Abuse on Interpersonal Problems

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of child abuse on the IIP; results indicated a significant difference between groups, $F(2,86) = 4.571$, $p<.05$. A Tukey post-hoc test revealed that IIP was significantly higher for the CPA group compared to the non-abused group. The CSA group did not differ significantly from either the non-abused ($p = .18$) or the CPA ($p = .60$), groups. Child abuse group scale means and standard deviations are presented in Table 5 for all variables of interest.

Impact of Abuse on Immune Functioning

A one-way between-groups analysis of variance (ANOVA) was also conducted to explore the impact of child abuse on the Total sIgA levels. Results failed to indicate a significant difference between groups on Total sIgA levels ($F(2,86) = 0.517$, $p=.60$).

Mediation

As discussed in the proposed analyses section, the mediation analyses will be presented using the causal steps of Baron and Kenny (1986) and, if applicable, confirmed using Hayes and Preacher (2012) MEDIATE. The analyses are based on partial correlation and linear regression analyses. Age and recent sexual experiences were controlled in all of the following analyses.

First, child abuse group was not significantly associated with sIgA (See Table 5). Second, child abuse group did significantly predict IIP ($F(3, 85) = 3.209$, $p < .05$, $R^2 = .09$). Specifically, CPA ($\beta=.32$, $p < .01$) was a significant predictor of IIP, but CSA ($\beta = .19$, $p = .10$) was not. Third, once controlling for child abuse group, IIP was not a significant predictor of sIgA (See Table 5). Age was a significant predictor of sIgA ($\beta = .371$, $p < .01$). This finding suggests that as age increases, it predicts a higher sIgA Total Average. Further, SES was a significant predictor of sIgA ($\beta = -.244$, $p < .05$). This finding suggests that as SES increases, it predicts a lower sIgA Total Average. While a significant relationship between the predictor and outcome is not needed to demonstrate mediation (MacKinnon & Fairchild, 2009), the analyses also failed to demonstrate a significant relationship between the mediator and the outcome. Therefore, mediation was not supported and MEDIATE analyses were not conducted.

5.3 Herpes Simplex Virus Type 1 Specific Antibody

Chi-Square Test for Independence

A Chi-square test for independence (with Pearson's Chi-Square Value) was run to explore if there were significant associations between child abuse group (i.e., none, CPA, CSA) and detectable HSV-1-sIgA. The test indicated a significant association between abuse group and detectable HSV-1-sIgA, $X^2(2) = 6.033$, $p < .05$, Cramer's V = .260. A Cramer's V of .20 is considered a medium effect size. Of the total sample of 89 participants, 30 (33.7%) had detectable levels of HSV-1-sIgA. In the non-abused group, 22 (53.7%) had non-detectable levels of HSV-1-sIgA, while 19 (46.3%) had detectable levels. In the CPA group, 18 (72.0%) had non-detectable HSV-1-sIgA, while 7 (28. 0%) had detectable levels. In the CSA group, 19 (82.6%) had non-detectable HSV-1-sIgA, while 4 (17.4%) had detectable levels.

Chi-square tests for independence (with Yates Continuity Correction) were run to explore differences between two groups and detectable HSV-1-sIgA. When comparing CPA and non-abused groups, the test indicated no significant association between abuse group and detectable HSV-1-sIgA, $X^2(1) = 1.487$, *ns*, phi = -.182. When comparing CPA and CSA groups, the test indicated no significant association between abuse group and detectable HSV-1-sIgA , $X^2(1) = .281$, *ns*, phi = -.126. When comparing CSA and non-abused groups, the test indicated a significant association between abuse group and detectable HSV-1-sIgA, $X^2(1) = 4.180$, $p < .05$, phi = -.290, which is considered a medium negative effect. This means that the CSA group was less likely to have detectable HSV-1-sIgA. See Table 6 for a full list of counts and percentages by abuse group.

Logistic Regression

To examine childhood abuse status as a predictor of detectable HSV-1-sIgA, two dummy variables were necessary. Logistic regression analysis (See Table 7) revealed that the overall model including childhood victimization status as a predictor (i.e., two dummy variables) was statistically significant, χ^2 (2, $N = 89$) = 6.236, $p < .05$, indicating that the model was able to distinguish between respondents who did and did not evidence detectable HSV-1-sIgA. The model explained between 6.8% (Cox and Snell R square) and 9.4% (Nagelkerke R squared) of the variance in detectable HSV-1-sIgA, and correctly classified 66.3% of cases. As shown in Table 7, only childhood sexual abuse status as a predictor made statistically significant contributions to the model. CSA was associated with an odds ratio of 0.244 (B = -1.41). This

indicated that respondents who did report CSA were about a fourth as likely to evidence detectable HSV-1-sIgA than those who did not report child abuse, controlling for other factors in the model.

Impact of Abuse on Immune Functioning

Effect sizes were calculated comparing the abuse groups on the HSV-1-sIgA levels. Only the 30 participants with detectable HSV-1-sIgA levels were included in the analyses (i.e., 19 non-abused, 7 with CPA, 4 with CSA). HSV-1-sIgA levels for non-abused (M = .19, SD = .09), CPA (M = .29, SD = .17), and CSA (M = .27, SD = .19) groups were calculated. Overall, the HSV-1-sIgA levels were higher in the two abused groups. When looking at the impact of abuse group on HSV-1-sIgA levels, the effect size was moderate to large (eta squared = .12). When looking at the magnitude of the differences in the means of the CPA and non-abused group, the effect size was large (eta squared = .13). When looking at the magnitude of the differences in the means of the CSA and non-abused group, the effect size was moderate (eta squared = .08).

Chapter 6 - Discussion

Overall, results indicated that the main hypotheses were only partially supported. Group differences based on abuse histories were observed in HSV-1-sIgA, but not Total sIgA. Although abuse histories were related to interpersonal problems, IIP did not mediate the relationship between early abuse histories and immunological levels. These results were surprising given several studies that have found relationships between early abuse and immune levels, as well as the effects of psychosocial predictors. Considering these findings, however, several points can be made.

First, the current study Total IIP score (as seen in Table 1) had a slightly lower mean than Scarpa and colleagues (1999) found in their sample of 270 female college students ($M \approx 61$). Further, Wells (2010) noted in his sample of 597 female college students a similar mean (log 10 transformed IIP = 1.76). Therefore, the IIP in this study appears fairly comparable and consistent with prior studies. As expected, CPA was a predictor of more interpersonal problems. Further, a greater number of negative life events also predicted more interpersonal problems. This finding is consistent with literature that showed women with a history of child abuse had a higher number of interpersonal problems (Kernhof, Kaufhold, & Grabhorn, 2008). Further, exposure to life stress has been shown to have a negative effect on interpersonal functioning (Beck, Grant, Clapp, & Palyo, 2009). Surprisingly, CSA did not statistically predict interpersonal problems.

Interestingly, though not part of the main hypotheses, age of the participants was a significant predictor of Total sIgA levels. That is Total sIgA increased with age. While no known studies have looked at sIgA differences over a matter of a few years, Jafarzadeh, Sadeghi, Karam, and Vazirinejad (2010) noted that sIgA levels continually increase with age groups by decade, before decreasing in the 60-year-old decade. That is, 1-10 year olds had lower sIgA levels than 11-20 years old, who had lower sIgA levels than 21-30 years olds, and so on. Then, there was a decrease in subjects aged 61-70 years old. The current findings are consistent with the idea of immune functioning increasing with age during the early adult years.

The finding that there was not a significant relationship between the early abuse variables and Total sIgA was unexpected, given that stress is negatively related to sIgA (Hebert and Cohen, 1993; Koh & Koh, 2007; Yang et al., 2002) and related to an increase of health related services (Chartier, Walker, & Naimark, 2007). The results did suggest, however, that more

recent sexual experiences in adulthood (as measured by the SES) predicted a lower level of sIgA. This finding is consistent with previous research that shows acute disturbances in immune functioning following stressors. Phillips and colleagues (2006) noted that stressful life events within the past two years resulted in a negative association with sIgA secretion rates. Garcia-Linares and colleagues (2004) noted that adult women who were physically and psychologically abused evidenced impaired capacity to neutralize HSV-1. The researchers noted that most of the incidents of physical and psychological abuse occurred within the last 12 months. Considering that most participants were around 19-years-old, and the SES assessed experiences since age 18, the short-term impact makes sense. Results of the study add to the current research that suggests recent unwanted sexual experiences results in impaired immune functioning.

It is important to note that the SES scores and prevalence from the current study are slightly lower than those found by Koss, Gidycz and Wisniewski (1987). Koss and colleagues (1987) examined 3,187 college women. They noted that 54.4% of college women encountered some form of unwanted sexual experience, while in the present study 34.8% encountered unwanted sexual experiences. Despite the sample size in the present study being much smaller, one-third of the college women still experienced some form of sexual victimization.

Interpersonal problems were specifically examined in this study to explain the relationship between early abuse and health, especially considering the impact abuse has on interpersonal relationship formation (Taylor et al., 2004) and both the short-term and long-term impact of negative interpersonal relationships on health (Kiecolt-Glaser, 1999; Miller et al., 1997). Despite the extensive support for psychosocial relationships, several researchers also have noted no significant relationships. Rabkin and colleagues (1991), for example, found that several psychosocial predictors, including depression, anxiety, social conflict, and negative life events were unrelated to lymphocyte counts in men. Perry, Fishman, Jacobsberg, and Frances (1992) examined depression, anxiety, social support, and stressful life events. They also found that all of these variables were unrelated to lymphocyte counts. The current study was interested in long-term impacts, and one explanation for the lack of findings might be that many of the immune effects may be more short-lived.

When examining the HSV-1-sIgA results, several interesting findings emerged. Of note, only 33.7% of the total sample had detectable HSV-1 antibody. This finding is much lower than the 60% prevalence rates usually detected by young adulthood (Xu et al., 2006). The lower

prevalence rate may be due to participant self-selection bias, with participants who were not exposed to HSV-1 being more likely to participate in Phase-II Lab. The study was advertised as a Women's Study, and did indicate that researchers were interested in health and immune functioning during the Informed Consent. Women who may know that they have poor health may not have wanted to participate.

Chi-square tests for independence did reveal a significant association between abuse group and detectable HSV-1 antibody. The non-abused group evidenced a higher incidence of detectable HSV-1 antibody (46.3%) compared to the CSA group (17.4%). Previous research has demonstrated a link between early child stress, such as physical abuse, and increased HSV-1 antibody (Shirtcliff, Coe, & Pollak, 2009). This was thought to be suggestive of viral reoccurrence from dormancy, or that HSV-1 was returning more often, leading to a need to produce higher levels of antibody.

The current study suggests that those with a history of CSA actually evidenced a lower proportion of detectable HSV-1-sIgA compared to the non-abused group. Logistic regressions similarly revealed that a history of CSA significantly predicted lower likelihood of detectable HSV-1-sIgA. There is a chance that those without detectable HSV-1-sIgA were never infected with herpes simplex virus, and the proportion of women with non-detectable HSV-1 antibody does not appear to differ across abuse groups. The proportion of women with detectable HSV-1 antibody, however, does appear to be larger in the non-abused group. Without blood samples, however, one cannot confirm if participants did or did not have HSV-1. Previous researchers have noted that one can carry HSV-1 in the latent state, and this would not necessarily be evidenced in saliva depending on the kit used and unless the body was more active in trying to fight the infection, resulting in a false negative (Rand, Houck, & Dickinson, 1986).

One way to further explore the results is to look at HSV-1-sIgA in conjunction with the other immune variables. Although not statistically significant, the two abuse groups had lower Total sIgA averages overall. Researchers have suggested that not producing antibody at normal levels means a less competent immune defense. Examining the neutralizing capacity of HSV-1 is one way to further explore the possibility that these women are not able to fight infection. If those with a history of abuse are also not as likely to neutralize HSV-1, then their immune defenses are likely less competent. While not analyzable due to small *n* sizes, when examining only those with detectable levels of HSV-1-sIgA, a moderate to large effect size was found

across all three groups (eta squared = .12). More specifically, a large effect size (eta squared = .13) was found between the CPA and non-abused groups, while a medium effect size (eta squared = .08) was found between the CSA and non-abused groups. Considering the moderate to large effect sizes with such a small sample, with a larger sample size this study may have found statistically similar results such as those found by Shirtcliff and colleagues (2009). Therefore, although the CSA group contained a smaller proportion of women with detectable HSV-1 antibody, the data suggest that abused women with detectable levels may be less able to fight the infection or may be more likely to be in a current state of active infection.

Further, this was the first study to date that sought to explain the relationship between early abuse experiences and health through interpersonal problems. In previous studies, researchers have examined the impact of other potential sources of stress that may account for the relationship between early histories and health. McEwen and Seeman (1999) suggested that socioeconomic status may explain the relationship between early life experience and health. Specifically, they described it as a constant stressor and described how it leads to an allostatic load that cannot be reversed. They noted that mortality increases as socioeconomic status decreases. Further, Fuller-Rowell, Evans, and Ong (2012) noted that it was perceived social-class discrimination that explained the relationship between socioeconomic status and health.

Previous research has also examined the role of PTSD and immunity. Lemieux, Coe, and Carnes (2008) looked at twenty-four women a history of CSA. The researchers found that T-cell activation markers in the blood depended on the degree to which the women were currently manifesting symptoms of PTSD. Those who had more intrusive symptoms and fewer avoidant symptoms tended to have a compromised immune systems as indicated by the early activation marker. Those who had come to terms psychologically with their abuse had immune responses similar to the healthy control group. The impact of child abuse can be examined as a possible factor related to current immune levels.

Depression has also been examined as a predictor of health related issues. Patterson and colleagues (1995) noted that it was the interaction between life stress and depression that prospectively predicted a high percent of change in immune levels in HIV infected men. They also looked at the role of social measures, and found that there was not a relationship between social support and immune levels of interest, although lower social support tended to lead to a decrease in lymphocytes. Increased levels of interleukin-6 were found in cancer patients

(ASCO, 2006). Interleukin-6 is theorized to explain depressive symptomatology, in that there is an overlap between depression symptoms and sickness behavior (i.e., lethargy). Future research should examine the role of depression as a potential predictor of health related sequelae.

Further, other emotions may be an area for future research. Chronic anger/hostility and neuroticism/negative affectivity is linked with poor health (Smith, 2006). Denson, Spanovic, and Miller (2009) noted that if a person could cope in a way to alter appraisals and their emotional response, one could indeed improve their long-term health. General measures of affect and emotion regulation could be an area for further exploration of mediators.

6.1 Limitations

Several limitations should be highlighted when examining the results. First, the main limitation of this study is the small group size for the CPA and CSA groups compared to the non-abused group. The small sample size decreases power and the ability to explore more sophisticated interactions. The small sample also limited the HSV-1-sIgA findings. The use of a college sample limits the applicability to women outside of the college population. However, as noted, college samples tend to have higher victimization rates. The use of only women may also limit the findings. As noted before, women were chosen specifically for the study due to the tendency to view interpersonal relationships as more important, as well as the tendency to turn to friends during times of stress (Taylor et al., 2000). To reduce error caused by gender, only women were examined, but results may have been attenuated by reducing variability.

Another limitation of the present study is the nature of the self-report measures used. These instruments are often inaccurate, due to lack of knowledge, poor memory, and careless reports. Considering the sensitive nature of the questions asked, participants may not have been responding truthfully in order to come across in a more socially appropriate way. As was discussed in an earlier section, the study was advertised as a Women's Study that was interested in health and immune functioning. Women who were already in poor health or were extremely healthy may not have been interested in participation.

An important limitation to point out is that the present study did not include an evaluation of neglect. Neglect is often one of the most common forms of child abuse (Dubowitz & Bennett, 2007), and future studies should inquire about the impact of neglect. Further, while every step was taken to ensure the saliva samples were collected appropriately, with any biological sample there is always the risk for contamination. However, considering that the sIgA levels were in the

expected direction (i.e., non-abused group had higher sIgA levels than both abuse groups), the lack of statistical findings is likely the result of small sample size.

Finally, considering the sample was primarily Caucasian, the researcher was unable to examine ethnic differences on the sIgA, HSV-1-sIgA or the other variables of interest. Of note, African-Americans previously have been shown to have a higher incidence of HSV-1-sIgA. Due to the small sample sizes, this information could not be examined. Future studies should try to include a diverse sample to allow researchers to examine ethnicity, as well as other demographic variables.

Chapter 7 - Conclusions

The current study explored the chronic and long-term impacts of early abuse experiences. Specifically, this study examined abuse history as a risk factor for immune dysfunction in adulthood. This study also examined interpersonal problems as a risk factor for immune dysfunctions in adulthood. Participants were asked to complete measures related to early abuse experiences and current interpersonal deficits. It was hypothesized that interpersonal problems would mediate the relationship between type of abuse experiences and later immune functioning, as measured by sIgA.

Group differences were observed on interpersonal problems, with the CPA group evidencing greater interpersonal problems than the non-abused group. Neither child abuse nor interpersonal problems predicted sIgA. This was surprising, given the substantial literature supporting the health impact of early life stressors. The only significant predictors were age and recent unwanted sexual experiences. An increase in age was associated with an increase in Total sIgA, while an increase in unwanted sexual experiences was associated with a decrease in Total sIgA. Group differences in sIgA levels were observed, but these results were not significant. Future studies should consider these findings as potential factors to explore.

This study found that women with a history of CSA were less likely to have HSV-1-sIgA detected in their saliva. When examining just those with detectable levels of antibody, the CSA and CPA groups had higher HSV-1-sIgA levels, as well as large effect sizes. These results were similar to those found by Shirtcliff, Coe, and Pollak (2009), which also showed that those with a history of abuse had higher HSV-1-sIgA levels. Future studies examining immune deficits should look at different psychosocial variables, as well as more in depth analyses of recent unwanted sexual experiences.

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Table 1
Descriptive Statistics for Continuous Variables of Interest (N = 89)

Variable	Mean (*SD*)	Observed Range	Possible Range	Cronbach's Alpha	Skewness	Kurtosis
Demographics						
Age	19.24 (1.29)	18-23	-	-	.66	-.61
Phase I						
Inventory of Interpersonal Problems	50.96 (29.29)	0-146	0-188	.96	1.16	1.41
Log 10 Inventory of Interpersonal Problems	1.97 (.12)	1.67-2.29	-	.96	.39	.07
Life Events Checklist	63.08 (15.27)	45-124	45-180	.90	1.40	2.92
Log 10 Life Events Checklist	1.79 (.10)	1.65-2.09	-	.90	.69	.31
Phase II						
Sexual Experiences Survey	10.91 (1.35)	10.00-17.00	10.00-20.00	.70	2.01	4.89
Log 10 Sexual Experiences Survey	1.03 (.05)	1.00-1.23		.70	1.65	2.62
Secretory Immunoglobulin A Level	188.37 (143.51)	27.50-974.68	-	-	2.82	11.21
Log 10 sIgA Level	2.19 (0.28)	1.44-2.99	-	-	.06	.71

Table 2
Descriptive Statistics for Categorical Variables of Interest, Percentage (n) (N = 89)

	Abuse Group			
	None	CPA	CSA	Total
Race/Ethnicity				
Caucasian	90.2 (37)	68.0 (17)	52.2 (12)	74.2 (66)
African-American	0.0 (0)	8.0 (2)	13.0 (3)	5.6 (5)
Hispanic	2.4 (1)	8.0 (2)	8.7 (2)	5.6 (5)
Asian	4.9 (2)	16.0 (4)	17.4 (4)	11.2 (10)
Other	2.4 (1)	0.0 (0)	8.7 (2)	3.4 (3)
Student Status				
Full-time	100.0 (41)	92.0 (23)	100.0 (23)	97.8 (87)
Part-time	0.0 (0)	8.0 (2)	0.0 (0)	2.2 (2)
Sexual Orientation				
Heterosexual/Straight	100.0 (41)	100.0 (25)	91.3 (21)	97.8 (87)
Gay/Lesbian	0.0 (0)	0.0 (0)	4.3 (1)	1.1 (1)
Bisexual	0.0 (0)	0.0 (0)	4.3 (1)	1.1 (1)
Relationship Status				
Long-term relationship	31.7 (13)	32.0 (8)	26.1 (6)	30.3 (27)
Single or Never Married	68.3 (28)	68.0 (17)	73.9 (17)	69.7 (62)
Socioeconomic Status – Current Location				
Poor, Unemployed	0.0 (0)	4.0 (1)	4.3 (1)	2.2 (2)
Poor, Working Class	2.4 (1)	4.0 (1)	4.3 (1)	3.4 (3)
Blue Collar, Working Class	2.4 (1)	0.0 (0)	4.3 (1)	2.2 (2)
Lower Middle Class	4.9 (2)	16.0 (4)	8.7 (2)	9.0 (8)
Middle Class	61.0 (25)	60.0 (15)	70.0 (16)	62.9 (56)
Upper Middle Class/Professionals	29.3 (12)	16.0 (4)	8.7 (2)	20.2 (18)
Wealthy	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)

Note: None = Non-abused, CPA = Child physical abuse, CSA = Child sexual abuse

Table 2
Continued, Percentage (n)

	Abuse Group			
	None	CPA	CSA	Total
Socioeconomic Status – Original				
Location				
Poor, Unemployed	0.0 (0)	0.0 (0)	4.3 (1)	1.1 (1)
Poor, Working Class	0.0 (0)	8.0 (2)	8.7 (2)	4.5 (4)
Blue Collar, Working Class	0.0 (0)	8.0 (2)	4.3 (1)	3.4 (3)
Lower Middle Class	0.0 (0)	16.0 (4)	13.0 (3)	7.9 (7)
Middle Class	41.5 (17)	40.0 (10)	26.1 (6)	37.1 (33)
Upper Middle Class/Professionals	56.1 (23)	24.0 (6)	43.5 (10)	43.8 (39)
Wealthy	2.4 (1)	4.0 (1)	0.0 (0)	2.2 (2)
Income				
Less than $10,000	7.3 (3)	4.0 (1)	13.0 (3)	7.9 (7)
$10,000 to $25,000	2.4 (1)	12.0 (3)	4.3 (1)	5.6 (5)
$25,000 to $50,000	4.9 (2)	0.0 (0)	13.0 (3)	5.6 (5)
$50,000 to $75,000	17.1 (7)	20.0 (5)	13.0 (3)	16.9 (15)
$75,000 to $99,999	12.2 (5)	28.0 (7)	17.4 (4)	18.0 (16)
$100,000 to $199,999	41.5 (17)	24.0 (6)	34.8 (8)	34.8 (31)
$200,000 or more	14.6 (6)	12.0 (3)	4.3 (1)	11.2 (10)

Note: None = Non-abused, CPA = Child physical abuse, CSA = Child sexual abuse

Table 3
Pearson Moment Correlations Among All Continuous Variables of Interest and Covariates (N=89)

Variable	1.	2.	3.	4.	5.
1. Age	1				
2. IIP	-.104	1			
3. LEC	-.168	.305**	1		
4. SES	.167	.122	.260*	1	
5. sIgA	.316**	.055	-.076	-.162*	1

Note. Interpersonal problem scores, sIgA, sexual experiences, and life events scores were log 10 transformed, IIP = Inventory of Interpersonal Problems, LEC = Life Events Checklist, SES = Sexual Experiences Survey, sIgA = Secretory Immunoglobulin A, * $p < .05$, ** $p < .01$.

Table 4
Descriptive Statistics for Continuous Variables by Abuse Group, Mean (Standard Deviation) (N = 89)

	Abuse Group		
	None	CPA	CSA
IIP	1.94 (.11)[a]	2.02 (.12)[a]	1.99 (.12)
LEC	1.77 (.10)	1.80 (.09)	1.80 (.10)
SES	1.01 (.03)[b]	1.04 (.04)	1.06 (.07)[b]
sIgA	2.21 (.29)	2.18 (.29)	2.14 (.26)

Note. Interpersonal problem scores, sIgA, sexual experiences, and life events scores were log 10 transformed. None = Non-abused, CPA = Child physical abuse, CSA = Child sexual abuse, IIP = Inventory of Interpersonal Problems, LEC = Life Events Checklist, SES = Sexual Experiences Survey, sIgA = Secretory Immunoglobulin A, [a] Tukey post-hoc $p < .05$, [b] Tukey post-hoc $p < .01$.

Table 5

Hierarchical Linear Regressions: Interpersonal Problems as a Mediator in the Relationship between Child Abuse Group and Secretory Immunoglobulin A (N = 89)

Variable	*B*	*SE*	β	
Model 1 – Outcome: sIgA				
Step 1				
Age	.076	.022	.353**	
SES	-1.246	.568	-.221*	$F(2, 86) = 7.445$, $p = .001$, $R^2 = .15$
Step 2				
Age	.077	.022	.359**	
SES	-1.328	.644	-.236*	
Dummy 1 (0 = None, 0 = CPA, 1 = CSA)	.021	.077	.034	
Dummy 2 (0 = None, 1 = CPA, 0 = CSA)	.012	.069	.020	$F(4, 84) = 3.659$, $p = .008$, $\Delta R^2 = .01$
Step 3				
Age	.080	.022	.371**	
SES	-1.370	.646	-.244*	
Dummy 1 (0 = None, 0 = CPA, 1 = CSA)	.008	.077	.014	
Dummy 2 (0 = None, 1 = CPA, 0 = CSA)	-.011	.071	-.019	
IIP	.290	.242	.127	$F(5, 83) = 3.229$, $p = .010$, $\Delta R^2 = .01$

Note. Interpersonal problem scores, sexual experiences survey and sIgA life events scores were log 10 transformed. None = Non-abused, CPA = Child physical abuse, CSA = Child sexual abuse, SES = Sexual Experiences Survey, sIgA = Secretory Immunoglobulin A, IIP = Inventory of Interpersonal Problems, * $p < .05$, ** $p < .01$.

Table 6

Contingency Table for Detectable Herpes Simplex Virus Type 1 Specific Antibody and Child Abuse Group (N = 89)

Abuse Group	HSV-1-sIgA	
	Not Detectable (*n*=59) (HSV-1-sIgA ≤ 0.1)	Detectable (*n*=30) (HSV-1-sIgA > 0.1)
None		
Count (*n*)	22	19
% Within Abuse Group (*n* / 41)	53.7	46.3
% within HSV-1-sIgA Group	37.3	63.3
% of Total (*n* / 89)	24.7	21.3
CPA		
Count (*n*)	18	7
% Within Abuse Group (*n* / 25)	72.0	28.0
% within HSV-1-sIgA	30.5	23.2
% of Total (*n* / 89)	20.2	7.9
CSA		
Count (*n*)	19	4
% Within Abuse Group (*n* / 23)	82.6	17.4
% within HSV-1-sIgA	32.2	13.3
% of Total (*n* / 89)	21.3	4.5
Total		
Count	59	30
% of Total (*n* / 89)	66.3	33.7

Note. HSV-1-sIgA = Herpes Simplex Antibody, None = Non-abused, CPA = Child physical abuse, CSA = Child sexual abuse

Table 7

Logistic Regression Analyses Testing the Childhood Abuse Status as a Predictor of Detectable Herpes Simplex Virus Type 1 Specific Antibody (N =89)

	B	*SE (B)*	*df*	*Odds Ratio*
Model 1 – Outcome: Detectable HSV-1-sIgA				
Dummy 1 (0 = None, 0 = CPA, 1 = CSA)	-1.41*	.63	1	.24
Dummy 2 (0 = None, 1 = CPA, 0 = CSA)	-0.80	.55	1	.45
Constant	-0.15	.31	1	.86

Note. HSV-1-sIgA = Herpes Simplex Virus Type 1 Specific Antibody, None = Non-abused, CPA = Child physical abuse, CSA = Child sexual abuse. **B* significant at the 0.05 level (2-tailed).

Appendix A

DEMOGRAPHICS QUESTIONNAIRE

Instructions: This survey involves how people perceive crime in their local community. For all of the following questions, please indicate your answer in the space provided. While answering the questions, please refer to your current situation and for where you live at this time. This means where you consider your primary place of residence, and your current lifestyle.

1. What is your name? _____ (Used in case of invitation for Phase II)

2. What is your email? _____ (Used in case of invitation for Phase II

3. What is your age? _____ years

4. What is your ***month and year of birth***? _____

5. Which of the following best describes your ethnicity/ race?
___Caucasian
___African-American
___Hispanic
___Asian
___Other (please specify): _____

6. Are you currently a full-time or part-time student?
____Full-time ____Part-time

7. What is your sexual orientation?
_____heterosexual/straight
_____gay/lesbian
_____bisexual

8. Marital Status:
____Married
____Long-term relationship
____Divorced or Separated
____Single or Never married
____Widowed

9.A. Which of the following best describes the majority of people who live within comfortable walking distance of the place where you currently live?
____ Wealthy
____ Upper middle class/professionals
____ Middle Class
____ Lower Middle Class

____ Blue-collar/White-collar working class
____ Poor, working class
____ Poor, unemployed

9.B. Which of the following best describes the majority of people who live within comfortable walking distance of the place where you are originally from?
____ Wealthy
____ Upper middle class/professionals
____ Middle Class
____ Lower Middle Class
____ Blue-collar/White-collar working class
____ Poor, working class
____ Poor, unemployed

10. What is your approximate yearly household income or, if dorm resident, parents income?
____ less than $10,000
____ $10,000- $25, 000
____ $25,000 - $50000
____ $50,000 - $75,000
____ $75,000 - $99,999
____ $100,000 - $199,999
____ $200,000 or more

11. How many total persons live in your household? _____

Appendix B

MEDICAL HISTORY QUESTIONNAIRE

1) **Do you regularly engage in exercise? □ No □Yes**

1a) If yes, how many <u>days</u> in a month do you exercise?

_____

1b) If yes, how many <u>minutes</u> do you exercise for on each occasion?

_____

1c) If yes, what is the <u>most common</u> type of exercise activity you engage in?

_____

_____

1d) If yes, what are some <u>other types</u> of exercise activities you frequently engage in?

_____

_____

1e) How would you describe your level of exertion when you do exercise from 1 to 6?

1	2	3	4	6
Light		Medium		Hard

2) **Has there ever been a time when you could not exercise on a regular basis because of a medical issue? □ No □Yes**

2a) If yes, please explain in detail:

_____

_____

3) **Indicate if you have a history of any of the following.**

You have had:

____a heart attack
____heart surgery
____cardiac catheterization
____coronary angioplasty (PTCA)
____pacemaker/implantable cardiac defibrillator/rhythm disturbance
____heart valve disease
____heart failure
____heart transplantation
____congenital heart disease

4) **Indicate if you have experienced any of the following symptoms in the past 12 months.**

____You experience chest discomfort with exertion.
____You experience unreasonable breathlessness.

____You experience dizziness, fainting or blackouts.
____You take heart medications.

5) **Indicate if any of the following currently describe you.**

____You have diabetes requiring insulin.
____You have asthma or other lung disease.
____You have burning or camping sensations in your lower legs when walking short distances.
____You have musculoskeletal problems that limit your physical activity.
____You have concerns about the safety of exercise.
____You take Beta blocker medications (e.g., medications for blood pressure, heart issues).
____You wear braces or a permanent retainer

6) **Are you currently taking any medications? □ No □Yes**

6a) If yes, what? How much? Why?
_____

7) **Do you have any known allergies? □ No □Yes**

7a) If yes, what allergies do you have? Please be specific.

8) **Are you allergic to any food? □ No □Yes**
8a) If yes, what food are you allergic to? Please be specific.
_____
_____

9) **Have you ever had a head injury? □ No □Yes**
9a) If yes, please explain.
_____
_____

10) **Have you ever been knocked unconscious for longer than 5 minutes? □ No □Yes**
8a) If yes, please explain.
_____

Last Menstrual Period: _____

Heavy Bleeding (> 6 days; or > 3 days with 2 or more tampons): Yes No

Irregular cycle length (7 days or more): Yes No

Severe menstrual Pain/Cramps/Nausea: Yes No

Severe pre-menstrual emotional changes (e.g., anxiety/agitation, irritability/anger, mood swings, depression before your period): Yes No

Appendix C

CHILD ABUSE SURVEY - MODIFIED

Please use the scale below to answer the following two sets of questions as they apply to your experiences *prior to 14 years of age*.

0 = never true
1 = rarely true
2 = sometimes true
3 = often true
4 = very often true

A. When I was growing up, this happened to me *by someone who was at least **5 years*** older than me…

1. I was kissed and/or hugged in a sexual way.	0	1	2	3	4
2. Someone touched parts of my body, except for my sex organs, in a sexual way.	0	1	2	3	4
3. Someone touched my sex organs in a sexual way.	0	1	2	3	4
4. Someone put my sex organs in his/her mouth.	0	1	2	3	4
5. Someone had sexual intercourse with me.	0	1	2	3	4
6. Someone had anal intercourse with me.	0	1	2	3	4
7. Someone threatened to hurt me or tell lies about me unless I did something sexual with him/her.	0	1	2	3	4

NOTE: For Section B, only mark those events that resulted in physical marks, breaks in the skin, bruises, or injury that required medical treatment, even if it was not received. Also, only include events that occurred *by a caregiver* (that is, a babysitter, parent, step-parent, grandparent, sibling, etc. who was responsible for you at the time.)

B. When I was growing up…

1. Someone hit me really hard.	0	1	2	3	4
2. Someone kicked me.	0	1	2	3	4
3. Someone punched me.	0	1	2	3	4
4. Someone threw me down.	0	1	2	3	4
5. Someone stabbed me.	0	1	2	3	4
6. Someone punished me with a belt or other hard object.	0	1	2	3	4
7. I was the victim of some other physical act.	0	1	2	3	4

In Section A only, if you answered "0" to all seven items, please go to link _____ to complete this study.
In Section A only, if you answered "1" or higher to ANY of the seven items, please go to link _____ to complete this study.

Appendix D

INVENTORY OF INTERPERSONAL PROBLEMS

Instructions: Here is a list of problems that people report in relating to other people. Please read the list below, and for each item, consider whether that problem has been a problem for you with respect to any significant person in your life. Indicate your answer in the space provided.

1 = Not at all
2 = A little bit
3 = Moderately
4 = Quite a bit
5 = Extremely

Part I. The following are things you find hard to do with other people.

It is hard for me to…

1._____ trust other people.
2._____ say "no" to other people.
3._____ join in groups.
4._____ introduce myself to new people.
5._____ be assertive with another person.
6._____ do what another person wants me to do.
7._____ get along with people who have authority over me.
8._____ make reasonable demands of other people.
9._____ socialize with other people.
10._____ feel comfortable around other people.
11._____ express my feelings to other people directly.
12._____ be supportive of another person's goals in life.
13._____ really care about other people's problems.
14._____ maintain a working relationship with someone I don't like.
15._____ set goals for myself without other people's advice.
16._____ accept another person's authority over me.
17._____ ignore criticism from other people.
18._____ feel like a separate person when I am in a relationship.
19._____ put somebody else's needs before my own.
20._____ take instructions from other people who have authority over me.
21._____ feel good about another person's happiness.
22._____ get over the feeling of loss after a relationship has ended.
23._____ ask other people to get together socially with me.
24._____ be assertive without worrying about hurting the other person's feelings.
25._____ be self-confident when I am with other people.

Part II. The following are things that you do too much.

26._____ I fight with other people too much.
27._____ I am too sensitive to criticism.
28._____ I get irritated or annoyed too easily.
29._____ I am too sensitive to rejection.
30._____ I am too aggressive toward other people.
31._____ I try to please other people too much.
32._____ I feel attacked by other people too much.
33._____ I criticize other people too much.
34._____ I am affected by another person's moods too much.
35._____ I am too afraid of other people.
36._____ I worry too much about other people's reactions to me.
37._____ I am influenced too much by another person's thoughts and feelings.
38._____ I worry too much about disappointing other people.
39._____ I lose my temper too easily.
40._____ I tell personal things to other people too much.
41._____ I am too easily bothered by other people making demands of me.
42._____ I argue with other people too much.
43._____ I am too envious and jealous of other people.
44._____ I feel competitive even when the situation does not call for it.
45._____ I feel embarrassed in front of other people too much.
46._____ I feel too anxious when I'm involved with another person.
47._____ I want to get revenge against people too much.

Appendix E

LIFE EVENTS CHECKLIST - MODIFIED

Instructions: Below is a list of things that sometimes happen to people. Select the items that you experienced **between the ages 14-18**. This questionnaire is only concerned with events perceived as NEGATIVE. If the event happened and you did not perceive it as negative, select the N/A category. Select the negative events by indicating how much you feel the event has changed or has had a negative effect on your life by selecting the appropriate statement (no effect, some effect, moderate effect, large effect). Remember, for each negative event you have experienced **between the ages 14-18**, select it by indicating how much of an effect the event had on your life. If an event happened to you, but it was not negative (had a positive impact on your life) select N/A. Also, if an event did not happen to you at all, select N/A.

1=N/A
2=None
3=Some
4=Moderate
5=Large

1._____ Moving to a new home
2._____ New brother or sister
3._____ Changing to a new school
4._____ Serious injury or injury to a family member
5._____ Parents divorced
6._____ Increased number of arguments between parents
7._____ Mother or father lost job
8._____ Death of a family member
9._____ Parents separated
10._____ Death of a close friend
11._____ Increased absence of parent from the home
12._____ Brother or sister leaving home
13._____ Serious illness or injury of close friend
14._____ Parent getting in trouble with the law
15._____ Parent getting a new job
16._____ New stepmother or stepfather
17._____ Parent going to jail
18._____ Change in parents' financial status
19._____ Trouble with brother or sister
20._____ Special recognition for good grades
21._____ Joining a new club
22._____ Losing a close friend
23._____ Decrease in number of arguments with parents
24._____ Getting pregnant
25._____ Losing a job
26._____ Making the honor role

27._____ Getting a job of your own
28._____ New boyfriend/girlfriend
29._____ Failing a grade
30._____ Increase in number of arguments with parents
31._____ Getting a job of your own
32._____ Getting in trouble with the police
33._____ Major personal illness or injury
34._____ Breaking up with boyfriend/girlfriend
35._____ Making up with boyfriend/girlfriend
36._____ Trouble with teacher
37._____ Having an abortion
38._____ Failing to make an athletic team
39._____ Being suspended from school
40._____ Making failing grades on report
41._____ Making an athletic team
42._____ Trouble with classmates
43._____ Special recognition for athletic performance
44._____ Getting put in jail
45._____ Any other event

Appendix F

SEXUAL EXPERIENCES SURVEY

Instructions: For each of the following questions, answer whether you have had this experience **since age 18**.

1. Have you given in to sex play (fondling, kissing, or petting, but not intercourse) when you didn't want to because you were overwhelmed by a man/woman's continual arguments and pressure?
___ Yes ___ No
2. Have you had sex play (fondling, kissing, or petting, but not intercourse) when you didn't want to because a man/woman used his/her position of authority (boss, teacher, camp counselor, supervisor) to make you?
___ Yes ___ No
3. Have you had sex play (fondling, kissing, or petting, but not intercourse) when you didn't want to because a man/woman threatened or used some degree of physical force (twisting your arm, holding you down, etc.) to make you?
___ Yes ___ No
4. Have you had a man/woman attempt sexual intercourse (get on top of you, attempt to penetrate you) when you didn't want to by threatening or using some degree of force (twisting your arm, holding you down, etc.), but intercourse did not occur?
___ Yes ___ No
5. Have you had a man/woman attempt sexual intercourse (get on top of you, attempt to penetrate you) when you didn't want to by giving you alcohol or drugs, but intercourse did not occur?
___ Yes ___ No

6. Have you given in to sexual intercourse when you didn't want to because you were overwhelmed by a man/woman's continual arguments and pressure?
___ Yes ___ No

7. Have you had sexual intercourse when you didn't want to because a man/woman used his/her position of authority (boss, teacher, camp counselor, supervisor) to make you?
___ Yes ___ No
8. Have you had sexual intercourse when you didn't want to because a man/woman gave you alcohol or drugs?
___ Yes ___ No
9. Have you had sexual intercourse when you didn't want to because a man/woman threatened or used some degree of physical force (twisting your arm, holding you down, etc.) to make you?
___ Yes ___ No
10. Have you had sex acts (anal or oral intercourse or penetration by inanimate object) when you didn't want to because a man/woman threatened or used some degree of physical force (twisting your arm, holding you down, etc.) to make you?
___ Yes ___ No

Appendix G

DEBRIEFING FORM

If you are unable to reach Jonathan Waldron (540) 231-2594 or Dr. Angela Scarpa (540) 231-2615, one of the following agencies is available to assist you. If necessary, contact one of them to schedule an appointment.

Cook Counseling Center 240 McComas Hall Virginia Tech Blacksburg, VA 24061 Phone: (540) 231-6557 Fax: (540) 231-2104 www.ucc.vt.edu	**Women's Center** 206 Washington Street Blacksburg, VA 24061 Phone: (540) 231-7806 E-mail: Womctr@vt.edu www.womencenter.vt.edu
Psychological Services Center 3110 Price's Fork Road Blacksburg, VA 24061 Phone: (540) 231-6914 Fax: (540) 231-4250 www.psycservice.vt.edu	**RAFT Crisis Hotline** (540) 961-8400 or 1-888-717-3333 or 1-800-suicide www.nrvcs.org/units/ACCESS/RAFT/
Family Therapy Center of Virginia Tech Point West Commons 840 University City Blvd. Suite 1 Blacksburg, VA 24061 (540) 231-7201	**Psychology Department Main Office** 109 Williams Hall (0436) Blacksburg, VA 24061 Phone: (540) 231-6581
Montgomery Regional Hospital 3700 South Main Street Blacksburg, VA 24060 http://www.mrhospital.com/ Phone: (540) 953-5122	

Appendix H

INFORMED CONSENT FORM
(Phase I Screening)

Study title: Health and Immune Functioning in Young Adult Women Survivors of Child Sexual Abuse: A Pilot Study
Investigators: Angela Scarpa, Ph.D.
Jungmeen Kim, Ph.D.

I. Purpose of this Research

The purpose of this project is to assess the health and immune functioning of women survivors of childhood maltreatment. Not all women participants will have a history of child maltreatment, so we can examine differences due to having or not having such experiences.

II. Procedures

You are being asked to help the above researchers in a project that involves two phases. In Phase I, your part will be to fill out a series of questionnaires about traumas that you may or may not have experienced in childhood and your current health and stress. You will also be asked to fill out various questionnaires about other areas of your life, as it is now. You should understand that both women with and without a history of childhood trauma are needed for this project. After completing these questionnaires, you may be contacted again, by the researchers, to return to the lab for a second session (Phase II). During Phase II, you will be asked to complete additional questionnaires and cognitive tasks. In addition, the researchers will collect some physiological data, specifically heart rate, skin conductance, cortisol and antibody levels. To measure cortisol and antibody levels in Phase II, we will collect four samples of your saliva (2 per day for 2 days). You will receive a separate consent form if you are eligible and choose to return for that session. Today, you are only being asked to give consent for Phase I.

If you decide to participate, Phase I will consist of answering questions online and will last approximately 60 minutes. If contacted after the first session, the second part of your participation (Phase II) will last about another 60 minutes. **Your responses to the questionnaires and your biological information (if you participate in Phase II) will be confidential, unless you decide to contact one of the researchers about issues that may arise during the study or if you express intent to harm or kill yourself or someone else**. If at any time during the research process issues come up that are stressful or difficult, there will be phone numbers provided to you of places that you can contact to get support in dealing with your distress. Also, you may discontinue participation at any time. Although it is not part of this study, **if you do indeed feel like hurting yourself or someone else, we *strongly* encourage you to contact the Cook Counseling Center, on campus. We also encourage you to take similar steps if you experience any depressive or sad feelings from participating in the current study. Cook Counseling Center is specifically adapted to handle these types of cases. Their telephone number is (540) 231-6557**.

III. Risks

While completing the questionnaires you may experience some emotional distress when recalling childhood traumas. If, in thinking about past maltreatment you become emotional or agitated in any way, you understand that you may notify the experimenter, who is trained in intervention for such matters. If further assistance is needed, the principal investigator who is a licensed clinical psychologist, Dr. Angela Scarpa, will be called. If you need help immediately and Dr. Scarpa cannot be reached, the experimenter will assist you in contacting Cook Counseling Center or RAFT Crisis hotline. You also understand that services rendered by some of these agencies may be associated with a fee, which is paid by you.

IV. Benefits

There is a societal benefit of increasing the understanding of long-term outcomes of child maltreatment on healthy functioning. If you participate in Phase II, you will be asked if you would like to be mailed a summary of the study findings when the study is completed.

V. Extent of Anonymity

Confidentiality will be assured by assigning code numbers to all participants, and only these identifiers will appear on data collection instruments and documents used in statistical analyses. No information concerning a participant will be released without the participant's written consent. No presentations or publications resulting from this project will identify individual parties. Confidentiality will not be maintained, however, if you express intent to harm or kill yourself or someone else, as we are legally required to divulge that information to the appropriate public authorities.

VI. Compensation

You will receive extra credit points that can be averaged into your final grade, as permitted by your instructor. Usually, instructors permit one credit for each hour of participation, but this will depend upon your particular instructor. However, you may receive alternate forms of extra credit as permitted by your instructor that do not involve participation in this study yet still allow acquiring extra credit. Participants who are contacted after the first session and choose to participate in the second session will also be eligible to receive course credit, as permitted by their instructor.

VII. Freedom to Withdraw

You should understand that you are free to withdraw from the study at any time. If you choose to withdraw, your credit for participation will be prorated where you will receive ½ credit for 30 minutes or less and one credit for each hour of participation. You do not have to answer any questions that you do not choose to.

VIII. Participant's Responsibility

Signing of this form and agreement to participate is voluntary. Your participation for this phase (Phase I) involves completion of several questionnaires about past and recent events, as well as providing your contact information if you would be willing to participate in the second session. You should expect Phase I to last approximately 60 minutes.

IX. Participant's Permission

You have read and understood the Informed Consent Form and conditions of this project. You have had all your questions answered. You hereby acknowledge the above and give your voluntary consent for participation in this project. If you participate, you may withdraw at any time. You agree to abide by the rules of this project.

By completing the online survey, you are giving consent to participate in this study. If you do not wish to participate, simply exit the survey now.

Participant Signature Date

Should you have any questions about this research or its conduct, you may contact:

Angela Scarpa, Ph.D.
Principle Investigator
(540) 231-2615, ascarpa@vt.edu

Jungmeen Kim, Ph.D.
Principle Investigator
(540) 231-0951, jungmeen@vt.edu

Michelle Patriquin, M.S.
Project Coordinator
(540) 231-2594, mpatriq@vt.edu

Diana Riser, M.S.
Project Coordinator
driser@vt.edu

Jonathan Waldron, B.S.
Project Coordinator
(540) 231-2594, jwaldron22@vt.edu

Julee Farley
Project Coordinator
farleyjp@vt.edu

Dr. David Moore
Chair, IRB
(540) 231-4991, moored@vt.edu

Dr. David Harrison
Chair, Psychology Human Subjects
(540) 231-4422, dwh@vt.edu

Appendix I

INFORMED CONSENT FORM
(Phase II Experiment)

Study title: Health and Immune Functioning in Young Adult Women Survivors of Child Sexual Abuse: A Pilot Study
Investigator: Angela Scarpa, Ph.D.
Jungmeen Kim, Ph.D.

I. Purpose of this Research

The purpose of this project is to assess the health and immune functioning of women survivors of childhood sexual abuse. Not all women participants will have a history child sexual abuse, so we can examine differences due to having or not having such experiences.

II. Procedures

You are being asked to help the above researchers in a project. For this session (called Phase II) you will complete questionnaires and a cognitive task. Also, the researchers will collect some physiological data, specifically your heart rate, skin conductance, and antibody levels. Your antibody levels are measured through the saliva.

If you decide to participate, the overall process with take approximately 60 minutes. This study will also involve gathering 2 collections of your saliva 2 times a day, once in the morning (between 8 a.m. and 9 a.m.) and again in the evening (between 8 p.m. and 9 p.m.), which you will obtain on 2 consecutive days. In addition, the saliva must be collected starting approximately the ninth day after the beginning of your menstrual period. You will be asked to store your saliva samples in your home refrigerator temporarily and bring the saliva samples to the research lab on the day following the last day of data collection. The research team will provide you with verbal and written instructions of this process and the materials that you will need. You will be provided with instructions on how to collect your saliva at home and a document to record the time taken for collection. Heart rate and skin conductance will be measured using electrodes placed on the chest, rib cage, and fingers. No garments need to be removed to apply electrodes in these places. However, the garment may need to be lifted to place the electrodes and then returned to its normal position. You will be shown how to apply the electrodes by a female experimenter, and then you will be asked to apply the electrodes to myself and notify the experimenter when you are done. If you do not feel comfortable doing this, you are not required to do so. You may also request that the female experimenter apply the electrodes. There could be some discomfort from wearing or removing the electrodes, much like the feeling of a Band-Aid. **You should understand that your responses to the questionnaires and your biological information will be confidential, unless you decide to contact one of the researchers about issues that may arise during the study or if you express intent to harm or kill yourself or someone else**. If at any time during the research process issues come up that are stressful or difficult, there will be phone numbers provided to you of places that you can contact to get support in dealing with your distress. Also, you may discontinue participation at any time. Although it is not part of this study, **if you do indeed feel like hurting yourself or someone else, we *strongly* encourage you to contact the Cook Counseling Center, on campus. We**

also encourage you to take similar steps if you experience any depressive or sad feelings from participating in the current study. Cook Counseling Center is specifically adapted to handle these types of cases. Their telephone number is (540) 231-6557.

III. Risks

There are no more than minimal risks to you from providing saliva samples and answering the questionnaires. However, while completing the questionnaires you may experience some emotional distress when recalling childhood traumas. As the immune measures taken from the saliva are not a standardized clinical test, there is no diagnostic value that can be gathered from the results. As stated above, there could be some discomfort from wearing or removing the electrodes, much like the feeling of a Band-Aid. Note, however, that these procedures have been used by these investigators in several other studies, with no complaints.

IV. Benefits

There is a societal benefit of increasing the understanding of long-term outcomes of child sexual abuse on healthy functioning. After the second day of saliva collection, you will be asked if you would like to be mailed a summary of the study findings.

V. Extent of Anonymity

Confidentiality will be assured by assigning code numbers to all participants, and only these identifiers will appear on data collection instruments and documents used in statistical analyses. Saliva samples will be sent for antibody and cortisol levels analysis at the laboratory of Dr. Christopher Coe at the University of Wisconsin. No information concerning a participant will be released without the participant's written consent. No presentations or publications resulting from this project will identify individual parties. Confidentiality will not be maintained, however, if you express intent to harm or kill yourself or someone else, as we are legally required to divulge that information to the appropriate public authorities.

VI. Compensation

You will receive extra points that can be averaged into your final grade, as permitted by your instructor. Specifically, you will receive one credit for each hour of participation. However, you may receive alternate forms of extra credit as permitted by your instructor that do not involve participation in this study yet still allow acquiring extra credit. In addition, you will receive $10 compensation upon completion of Phase II.

VII. Freedom to Withdraw

You should also understand that you are free to withdraw from the study at any time. If you choose to withdraw, your credit for participation will be prorated where you will receive ½ credit for 30 minutes or less and one credit for each hour of participation. You do not have to answer any questions that you do not choose to.

VII. Participant's Responsibility

Signing of this form and agreement to participate is voluntary. You are responsible for answering questionnaires about your past and recent experiences and providing your physiological data. In addition, you agree to provide two saliva collections on two consecutive days, once in the morning and again in the evening. Also, you agree to keep saliva samples in a

sealed bag in your home refrigerator until all four samples are collected, and bring in the cold samples to the research lab by appointment.

X. Participant's Permission

You have read and understood the Informed Consent Form and conditions of this project. You have had all your questions answered. You hereby acknowledge the above and give your voluntary consent for participation in this project. If you participate, you may withdraw at any time. You agree to abide by the rules of this project.

Participant Signature Date

Should you have any questions about this research or its conduct, you may contact:

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Dr. David Harrison
Chair, Psychology Human Subjects
(540) 231-4422, dwh@vt.edu