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The Effect of Early Life Stress on Subjective Fear and Electrodermal Response Reactivity in an Adolescent Community Sample

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by

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Abstract

Past research demonstrates that a stressful environment early in life can have profound implications on an individual's ability to regulate their emotions. One method that researchers use to assess abnormalities in emotion regulation is fear conditioning, where differences in the speed or strength with which one learns about unpleasant stimuli can indicate dysregulation. Currently, the literature is in conflict about whether those who have experienced early life stress (ELS) will show exaggerated or blunted responses to stressful stimuli, but both can cause problems later in life. The present study used a fear conditioning paradigm to further clarify the relationship between ELS and physiological reactivity during a fear conditioning task using a community sample of adolescents. We predicted that adolescents with greater reported levels of ELS would show exaggerated responses to the CS+ during acquisition and extinction. Additionally, we predicted that adolescents with greater levels of ELS would show lower rates of discrimination learning. Thirty-seven participants completed the Risky Families Questionnaire (RFQ) and the teen form of the Alabama Parenting Questionnaire (APQ) to measure cumulative ELS and had their skin conductance response measured during a fear conditioning task to assess their physiological reactivity. Regression analyses revealed that, contrary to our hypothesis, adolescents who reported higher levels of ELS subjectively reported less fear, but showed stronger physiological responses during the acquisition and extinction phases of the fear conditioning task which was in accordance with our hypothesis. Contrary to our hypothesis, analyses showed that individuals with higher indices of ELS showed greater discrimination learning during acquisition. Overall, this study highlights the importance of trans-diagnostic approaches to inform early and effective interventions.

The Effect of Early Life Stress on Subjective Fear and Electrodermal Response Reactivity in an Adolescent Community Sample.

A stressful environment early in life has been associated with numerous negative physiological and psychological outcomes (Repetti, Taylor, & Seeman, 2002). A stressful early home environment, which is often marked by exposure to events like parental death, unemployment, and physical, verbal or sexual abuse, has been associated with increased risk for psychiatric disorders, including anxiety (Sharma, Prakash, and Kalra, 2016), depression, suicide, PTSD, conduct disorders and drug abuse (Lai & Huang, 2011).

At the same time, early life stress (ELS) has been associated with a number of physical health risks later in life, including increased risk for chronic, noncommunicable diseases like ischemic heart disease, cancer, chronic lung disease, skeletal fractures, liver disease, type II diabetes (Lai & Huang, 2011), and poor immune function (Taylor, Lerner, Sage, Lehman, & Seeman, 2004). Given this prolonged suffering, the risk for mortality, and the healthcare costs that are caused by these physical and mental illnesses, it is imperative that researchers uncover mechanisms by which early life stressors create risk for poor health outcomes early in life. This research can help inform prevention and intervention efforts earlier in development, when they may have a stronger impact on stress-exposed individuals.

Defining Early Life Stress

Researchers have defined ELS in a number of ways: singular traumatic events (e.g. car crash or natural disaster; Lai & Huang, 2011), exposure to repeated abuse or neglect, or checklists of major life stressors such as frequent moves, divorce, and unemployment (Petchel & Pizzagalli, 2011). Unfortunately, many of these methods ignore the co-occurrence of multiple

stressors in the early environment. In fact, many studies show that early life stressors are more likely to be cumulative rather than specific isolated events. One study that analyzed adverse early experiences in childhood found that two-thirds of their sample population that reported at least one adverse childhood experience (ACE), also reported another ACE. They also found that the presence of one ACE significantly predicted the occurrence of multiple (Dong et al., 2004).

One explanation for the occurrence of cumulative adversity is the fact that these stressors are often rooted in the socioeconomic context of the family. A study by Gary Evans and Kimberly English (2003) established that a sample of children who grew up in low-income communities were faced with a greater amount of physical (crowding, noise) and psychosocial stressors (violence, family turmoil) than their middle- and upper-income counterparts. This study demonstrated that multiple early life stressors were often generated within stable structural contexts. Research that only looks at singular stressors as the source of dysfunction (e.g., Aseltine & Kessler, 1993; Turner, Kessler, & House, 1991), can be problematic because these studies may misattribute negative outcomes to a singular event and ignore other significant contextual events. For example, research by Aseltine and Kessler (1993) stated that marital disruption predicted increased levels of depression in a community sample but did not account for other stressful life events associated with marital disruption such as a death in the family or previous mental health issues. A publication by Turner, Kessler, and House (1991) stated that unemployment status predicted elevated levels of internalizing psychopathology compared to well-employed populations not taking into account other social factors contributing to this psychopathology. While these types of studies can be useful for studying the impacts of isolated events on mental and physical health they cannot, in isolation, provide an explanation for bad outcomes (Hammen, 1997).

In order to address these issues, many researchers have begun to conceptualize early life stress more holistically, by identifying and measuring diverse adversities that, when taken as a whole, contribute to a harsh or risky environment early in life. One of the most validated approaches for conceptualizing these early family environments suggests that harsh or risky family environments are characterized by high levels of conflict and aggression, as well as cold, unsupportive, and neglectful relationships (Repetti, Taylor, & Seeman, 2002). Early in life, infants and children are dependent on their environment for emotional and social nurturance (Repetti, Taylor, & Seeman, 2002). As a result, when the home environment is cold, aggressive, and/or unemotional, the child is at an increased risk for developing deficits in their ability to regulate emotion; which can later produce disruptions in psychosocial functioning (Repetti, Taylor, & Seeman, 2002; Streeck-Fisher & van der Kolk, 2000). Given the importance of assessing the complexity of the family environment for understanding an individual's risk for emotional and physical disorder across development, the current thesis used this "risky families" framework to assess and test the impacts of ELS.

The Negative Effects of ELS on Emotion Regulation

Parenting style and early family environment have significant impacts on the development of emotion regulation skills in children (Chang, Schwartz, Dodge, & McBride-Chang, 2003). Emotion regulation is the cognitive process of recognizing, evaluating, and subsequently monitoring and adjusting one's emotional state to respond appropriately to situations in one's external and internal environments (Berking & Wupperman, 2012). From infancy to early childhood, the caregiver plays a vital role in the development of emotional regulation and management skills (Taylor, Eisenberger, Saxbe, Lehman, & Lieberman, 2006), and in normal development, the child will take more responsibility for these skills over time

(Berking & Wupperman, 2012). However, research shows that individuals who are raised in harsh and risky environments may show deficits in emotion management and regulatory skills (Burns, Fischer, Jackson, & Harding, 2012; Taylor et al., 2004). For example, studies confirm that children who grow up in harsh family environments have shown abnormal emotional responses during stressful circumstances (Taylor et al, 2006). Abnormal stress responses further enhance the individual's risk for emotional and behavioral problems (Repetti, Taylor, & Seeman, 2002) in adolescence and adulthood. At the current time, there are conflicting findings regarding how these abnormal stress responses manifest and present in these individuals.

A study by Miller and Chen (2010), suggested that maltreated children develop a hyper-vigilance for cues that denote anger or threat. The children in this study showed an exaggerated emotional response to angry adult interactions that lasted well into their adult years; long after they had left the risky environment. One explanation for this finding is that trauma early in life disrupts attentional processes during stress, such that those who have experienced trauma have enhanced attention for and trouble disengaging with stressful stimuli (Marusak, Martin, Etkin, & Thomason, 2014; Tottenham et al., 2010). Additionally, a study by Shapero et al. (2014) demonstrated that emotional abuse during childhood impacted the ability of young adults to manage emotional events in their daily lives, such that those who had experienced higher levels of abuse showed heightened reactivity to adverse events. Both of these studies indicate that ELS can result in long-lasting increases in vigilance and reactivity to stressors.

On the contrary, some studies have shown that people who have grown up in risky family environments show blunted responses to emotional stimuli. Research by Taylor et al. (2004) used the Risky Families Questionnaire (RFQ; Felliti et al., 1998; Taylor et al, 2004) in an

undergraduate population to measure the cumulative severity of familial risk factors and found that adolescents with higher RFQ scores showed blunted responses to passive fearful stimuli.

As a composite, these studies indicate that those who grow up in harsher and riskier environments might be less likely to develop healthy and effective threat detection or emotion management skills for stressful situations (Pattwell & Bath, 2017). However, there is no clear indication whether ELS primarily leads to exaggerated or blunted stress responses.

ELS and Physiological Markers of Emotion Regulation

Many physiological mechanisms, including the immune system, HPA axis, SNS, and PSNS, play an important role in a person's response to challenges in their environment (Thompson, 2014). For example, the immune system responds to biological threats like allergens and pathogens, however, chronic stress significantly diminishes the immune system's effectiveness, putting the individual at a greater risk for contracting disease (Sallah, 2008). Research also suggests that ELS impairs HPA axis functioning which contributes to maladaptive adrenocortical responses which, in turn, result in deficient emotion regulation (Repetti, Taylor, & Seeman, 2002). Research by Tarullo and Gunnar (2006) found that adults who were maltreated during childhood produced lower than average levels of cortisol when placed in a stressful situation. Additionally, a study on young adults indicated that those who had experienced adversity during childhood showed blunted cortisol responses to a stressful lab experiment (Elzinga et al., 2007). These researchers state that this blunted response results from long-term activation of human stress regulatory systems and as a result they show decreased stress reactivity to acute stressors in a laboratory setting. Although occasionally a biological necessity, prolonged or repeated activation of these pathways is associated with chronic emotion

dysregulation, which in turn contributes to a wide array of physical and mental health deficiencies later in life (Leucken & Lemery, 2004).

The sympathetic nervous system (SNS) is a key stress regulatory pathway that is impacted by ELS. For example, children tend to show profound sympathetic nervous system activation when exposed to angry adult interactions, a common feature of high conflict homes (Lovallo, 2013). When conflict is recurrent in the home, it leads to repeated sympathetic activation and alterations in sympathomedullary (SAM) reactivity to stressors, which creates risk for a host of physical disorders (Repetti, Taylor, & Seeman, 2002). Consistent with this idea, children who grow up in high-conflict homes have higher blood pressure and lower heart rate variability when compared with children from lower-stress homes, two risk factors linked to chronic health issues such as hypertension and coronary heart disease (Repetti, Taylor, & Seeman, 2002). Since the SNS plays such a vital role in physiological regulation, researchers have developed several ways to look at SNS responses such as sweat production (EMG), heart rate, and startle response (EMG). These various responses can be measured during emotion inducing tasks such as fear conditioning to analyze how stress impacts the SNS. These measures can help researchers map onto the physiological dysregulation of key pathways for emotion regulation. Because emotion regulation involves a combination of social and biological factors, a better understanding of physiological dysregulation is imperative to understanding the underlying mechanisms of emotion dysregulation.

Disruption and dysregulation of biological stress regulatory and response systems in childhood has numerous deleterious effects on physical and mental health in adolescence and adulthood. Biological systems do not exist in isolation and dysregulation of a singular system impacts many other systems (Repetti, Taylor, & Seeman, 2002). Dysregulation of regulatory and

response systems serves to exacerbate risk factors for physical disease (hypertension, cancer, accelerated aging) (Leucken & Lemery, 2004) and psychological disease (anxiety, depression, ADHD, etc). Preventative treatment is the most effective way to mitigate poor health outcomes associated with repeated and prolonged stress (Lovallo, 2013).

Early Life Stress and Fear Learning

A well-validated technique for studying the mechanisms underlying emotion regulation during stressful experiences is a discriminative fear conditioning paradigm (Pavlov & Gantt, 1928; Maren, Phan, & Liberzon, 2013). Discriminative fear conditioning involves pairing a previously neutral stimulus (CS+) with an aversive, unconditioned stimulus (US), while another neutral stimulus is not paired with the US (CS-). Over time, an individual is expected to learn that the CS+ is associated with the US, such that the presentation of the CS+ alone should elicit a fear response. In contrast, over time the CS- should not elicit a fear response as the individual should learn that it is not associated with the US.

In a fear conditioning paradigm, acquisition and extinction are two phases that are particularly informative when analyzing emotion regulation. During acquisition, the adolescent is repeatedly exposed to the CS+ paired with the US in order to create an association between the two. The acquisition phase allows the researcher to measure the length and amplitude of the fear response and determine whether typical fear learning occurs. After acquisition, the adolescent is repeatedly exposed to the CS+ without the US, or aversive stimulus, during the extinction phase. The extinction phase allows researchers to analyze whether or not the adolescent learns that the CS+ is no longer paired with the aversive stimulus (Cohen, Tottenham, & Casey, 2013). An individuals' learning can be measured in various ways, including their subjective perceptions of

fear, arousal, and expectancies about the CS+, CS-, and US as well as psychophysical indices of arousal including EDA, EMG, and heart rate variability.

Although fear learning is imperative for responding to environmental threats, this behavioral mechanism can become maladaptive if a person is unable to properly regulate and/or manage their fear responses. Evidence suggests that people who show exaggerated arousal in response to the CS+, as well as difficulties in extinction learning once the threat is removed, are at greater risk for psychological disorders like PTSD (Grillon and Morgan III, 1999), anxiety disorder (Waters, Henry, and Neumann, 2009), panic disorder (Grillon, Ameli, Goddard, Woods, & Davis, 1994), and ADHD (Pliszka, Hatch, Borcherding, & Rogeness, 1993), as well as other forms of psychopathology. For example, one study found that patients with PTSD had greater startle responses during acquisition when compared with control subjects, indicating higher arousal and potentially more efficient and exaggerated learning regarding the aversive stimulus (Rothbaum & Davis, 2003; Fani, Tone, Phifer, & Norrholm, 2011). In addition, patients with PTSD showed deficits in extinction learning, indicating that once these participants had associated a neutral stimulus with an aversive one, they showed little decline in their fear responses, even when the threat no longer existed. Along the same lines, anxiety symptoms in children have been linked to an increased likelihood of giving more negative evaluations of both the CS+ and the CS- (indicating a lack of discrimination in their learning about the two previously neutral stimuli), as well as deficits in extinction learning once the threat is removed (Waters and Pine, 2016).

Importantly, fear learning also appears to be influenced by a child's early exposure to stress. For instance, one study of maltreated children showed that, relative to controls, these children exhibited blunted skin conductance responses to the CS+ during a fear conditioning task

(Kadziolka, Pierdomenico, & Miller, 2016). The maltreated group also failed to show a discriminating skin conductance response between the CS+ and the CS-, indicating a deficit in discrimination learning (McLaughlin et al., 2016).

Thus, there is clear evidence that measures of fear learning are a reliable indicator of emotion dysregulation, and a key predictor of later risk for psychological (and physical) disorder. Moreover, there is some evidence that fear learning can be disrupted by significant early life stress. Nevertheless, many of the aforementioned studies have used these measures on children or adults, but a limited number have focused on adolescent populations. Relatedly, much of the research in this area of study has been primarily conducted in clinical samples but much less has been done in subclinical community samples; the group that makes up a majority of the population. Furthermore, most of these studies have used measures that only account for a singular dimension of stress. More comprehensive studies are necessary in order to accurately account for all of the stressors present in the environment.

Current Study

The current study seeks to address these gaps in the literature by examining the relationship between ELS and deficits in fear learning in a community sample of adolescents. Using a community sample allows us to capture a wide range of early life circumstances, relative to clinical samples, and by assessing adolescents, we aim to uncover risk for emotion dysregulation associated with ELS at a point early in development, when interventions might be most effective. We assessed the presence and severity of risky early family environments by using two well-validated scales that assess diverse characteristics associated with risky parenting styles and family environments. In addition, we collected multiple indicators of each

adolescent's fear learning processes, including both subjective and physiological (i.e., EDA) responses to the task.

In accordance with previous research on stress reactivity in adolescents (Repetti, Taylor, & Seeman, 2002), we hypothesized that an adolescent's score on the RFQ or APQ would predict their physiological response on a fear learning paradigm, such that individuals who reported higher levels of risky or harsh family experiences would exhibit exaggerated responses to the CS+ during the acquisition and extinction phases. Additionally, we hypothesized that adolescents with higher scores on the RFQ or APQ would exhibit higher subjective emotional responses and lower rates of discrimination learning because they tend to exhibit a hyper-vigilance for threat cues in their environment (Miller & Chen, 2010; McLaughlin et al., 2016).

Methods

Participants

A sample of forty-seven adolescents ages fourteen to seventeen years old was recruited from a predominantly upper-middle class community. Participants were recruited through school emails, and flyering at local community centers, libraries, and behavioral health clinics. All participants were fluent English speakers and attended the laboratory session with a parent/guardian (92.9 % mothers).

Procedure

Once the adolescents and their parents arrived for the laboratory session, they were provided with information about the study and completed informed assent (adolescent) and consent (parent/guardian) forms. Then the adolescent and their parent were separated, and each completed a set of baseline questionnaires about demographic characteristics and the child's early family environment on a desktop computer. After the questionnaires were completed, the

adolescent was prepared for the fear conditioning task. The fear conditioning task took approximately 20 minutes to complete. Once the adolescent finished the task, the adolescent and their parent were debriefed about the purpose of the study. The teen was compensated $20 and their parent was compensated $5 for their participation.

Fear Conditioning Task

Each adolescent completed a computerized differential fear conditioning task with partial reinforcement. The conditioned stimuli were images of a blue sphere and a green cube, one of which served as the CS+ and the other as the CS-. The unconditioned stimulus (US) was a one-hundred decibel scream sound played for one second binaurally through headphones. The shape paired with the US was counterbalanced across all adolescents.

The task was comprised of four phases: baseline, habituation, acquisition, and extinction. During the baseline phase the adolescent was asked to watch the screen where a fixed cross was presented for three minutes. Then, during the habituation phase, images of the CS+ and CS- were presented four times each for eight seconds without the US. During acquisition both the CS+ and the CS- were presented ten times for eight seconds. Throughout this phase, the CS+ was paired with the US in eight out of the ten presentations. Lastly, during the extinction phase the CS+ and CS- were presented again eight times each for eight seconds without the US. Following the habituation, acquisition, and extinction phases, the adolescents were asked to rate how fearful each image made them feel on a 7-point Likert scale ranging from 1 (not at all fearful) to 7 (very fearful). The task was programmed E-Prime and presented on a desktop computer in a dark and quiet room.

Measures

Questionnaires.

Demographic Information. Adolescents self-reported their gender, age, and race. They reported their race by selecting one or more of the following options: White, Black or African American, American Indian or Alaska Native, or Native Hawaiian or other Pacific Islander, or by selecting "other" and writing in their self-identified race. They also reported their ethnicity by selecting whether or not they identified as Hispanic/Latino. The parent self-reported total household income.

Early Life Stress. Adolescents reported early life stressors using the Risky Families Questionnaire (RFQ; Felitti et al., 1998; Taylor et al, 2004), a well-validated 13-item self-report scale. This scale assesses exposure to abuse (e.g., "How often did a parent or other adult in the household push, grab, shove, or slap you?"), neglect (e.g., "Would you say you were neglected while you were growing up, left on your own to fend for yourself?"), and disorganization or chaos (e.g., "Would you say that the household you grew up in was chaotic and disorganized?"), from ages 5 to15. Responses were recorded on a five-point Likert scale ranging from 1 (not at all) to 5 (very often). Questions with positive valences (e.g., "How often did a parent or other adult in the household make you feel that you were loved, supported, and cared for?") were reverse scored, and responses were summed to create a total score. Higher total scores indicate greater early life stress.

Additionally, adolescents reported about risky behavior and disciplinary styles used by their parents on the Alabama Parenting Questionnaire (APQ; Frick, 1991). This well-validated 42-item scale divides aspects of parenting into 5 subscales including involvement (e.g., "You have a friendly talk with your mom."), positive parenting (e.g., "Your parents tell you that you

are doing a good job."), poor monitoring and supervision (e.g., "You fail to leave a note or let your parents know where you are going."), inconsistent discipline (e.g., "Your parents threaten to punish you and then do not do it."), and corporal punishment (e.g., "Your parents slap you when you have done something wrong."). Adolescents responded to each item using a 5-point Likert scale ranging from 1 (never) to 5 (always) to indicate how often each event occurs in their home. Each subscale was scored separately, and higher scores indicated higher levels of dysfunction for negative categories (Poor Monitoring and Supervision, Inconsistent Discipline, & Corporal Punishment) and lower levels of dysfunction for positive categories (Involvement & Positive Parenting; Scott, Briskman, & Dadds, 2011). Of note, the involvement subscale is completed for each parent/guardian (mother and father within our sample) as relevant, and thus yielded two scores for some adolescents.

Fear Conditioning.

Subjective Fear. Adolescents reported their subjective fear about the CS+ and the CS- on a 7-point Likert scale ranging from 1 (not at all fearful) to 7 (very fearful) after habituation, acquisition, and extinction. Higher scores for each stimulus indicated greater fear learning for that individual stimulus.

Skin Conductance Response. Electrodermal Activity (EDA) was measured using two Ag/AgCl electrodes filled with an isotonic electrode paste (Braithwaite, Watson, Jones, & Rowe, 2013). The electrodes were placed on the middle phalanges of the adolescent's middle and fourth fingers on their non-dominant hand. Data was collected using Biopac technology and analyzed using Acqknowledge software.

The first interval skin conductance response (FIR) was calculated by subtracting the average skin conductance level (SCL) for the two seconds immediately before CS onset

(baseline) from the maximum SCL recorded during the first four seconds of the 8 second presentation. The second interval skin conductance response (SIR) was calculated by subtracting the average skin conductance level (SCL) for the two seconds immediately before CS onset (baseline) from the maximum SCL recorded during the last four seconds of the 8 second presentation. The SCR for the whole presentation was calculated by subtracting the average skin conductance level (SCL) for the two seconds immediately before CS onset (baseline) from the mean SCL recorded during the entire presentation. The average FIR, SIR, and Whole SCR were calculated by averaging the response for all of the 10 presentations in acquisition and again for all of the 8 presentations in extinction.

The rate of discrimination learning, the difference between the response to the CS+ and the CS-, was also calculated during the first interval, second interval, and whole presentation during acquisition and extinction. The discrimination parameter was calculated by subtracting the CS+ response by the CS- response for the first, second, and whole intervals. Once the difference was calculated, the average discriminative FIR, SIR, and Whole SCR was calculated by averaging the response for all of the 10 presentations in acquisition and again for all of the 8 presentations in extinction.

Then, separate linear regression analyses were used to predict each of these physiological parameters, as well as each of the subjective ratings of threat during acquisition and extinction from each measure of early life stress. Adolescent gender, age, race/ethnicity (white, non-Hispanic versus racial/ethnic minority group), and income were included as covariates in all analyses.

Results

Descriptive Statistics

Table 1 summarizes the demographic characteristics of the sample and includes correlations among key study variables. Of the 47 adolescents recruited for the study, 37 adolescents completed the entire study, five completed the study but had incomplete or missing physiological data files, and five opted out of the experiment. Of the remaining 42 who completed all or part of the study, age ranged from 14 to 17 years old (M=14.95, SD=0.95). Eighteen of the adolescents were female (42.9%) and twenty-four were male (57.1%). Thirty-two adolescents identified as white (76.2%), five identified as black or African American (11.9%), one identified as American Indian or Alaskan Native (2.4%), four identified as Hispanic or Latino (9.5%), three identified as biracial (7.1%), and one identified as another racial or ethnic group (2.4%). Information about family income was obtained from the parent and showed that the majority of families were upper or upper-middle class, with 59.5% of the sample reporting a family income of $100,000 or more. On average, adolescents' family incomes fell between $75,000 and $100,000.

On average, adolescents' responses about early family adversity on the Risky Families Questionnaire (RFQ; Felliti et al., 1998; Taylor et al, 2004) indicated that they were experiencing levels of abuse, neglect, and chaos in the home that were similar to or slightly lower than other community samples of young adults with an average score of 1.78 for the current sample versus scores ranging from 1.93 to 1.98 in other similar studies of young adults (Miller and Chen, 2010; Hanson and Chen, 2010; Crosswell, Bower, and Ganz, 2014). Compared to other adolescent samples (Frick, Christian, & Wootton, 1999), adolescents' responses on the Alabama Parenting Questionnaire (APQ; Frick, 1991) appeared to indicate that these adolescents have experienced

more stable and positive relationships with their parent(s) than other related samples. For example, the current sample reported higher parental involvement for both mother (M=34.26, SD=7.16) and father (M=28.60, SD=9.32), as well as more positive parenting (M=21.14, SD=5.11) and supervision (M=20.11, SD=5.60) relative to other samples. Adolescents in the current sample also reported lower levels of inconsistent discipline (M=12.86, SD=4.66) and corporal punishment (M=6.32, SD=2.70) than other adolescent samples.

Demographic characteristics did not appear to be associated with most key study variables, with the exception that father involvement was lower for older adolescents (r = -0.34, p < .05). The RFQ and APQ scores were correlated in the expected directions, with higher scores on the RFQ correlated negatively with the mother's involvement subscale (r = -0.43, p < .01) and the positive parenting subscale (r = -0.57, p < .01) on the APQ, and correlated positively with the poor monitoring and supervision subscale (r = 0.44, p < .01), inconsistent discipline subscale (r = 0.61, p < .01), and corporal punishment subscale (r = 0.76, p < .01).

Early Life Stress Measures and Subjective Fear Learning

Linear regression analyses examined the relationship between measures of early life stress and subjective ratings of fear, valence, and arousal during acquisition and extinction. Results showed that higher RFQ scores predicted lower fear ratings during the acquisition phase, over and above the effects of adolescent gender, age, race, and income (b= -0.10, SE= 0.05, β= -0.33, p < .05). In contrast, RFQ scores did not predict valence or arousal ratings during acquisition, and also did not predict fear, arousal, or valence ratings during the extinction phase (see Table 2 for full results).

Higher scores on the corporal punishment subscale of the APQ predicted significantly lower ratings of fear during acquisition (b= -0.41, SE= 0.14, β= -0.44, $p < .01$). However, the teen APQ subsections for involvement (mother and father), positive parenting, poor monitoring and supervision, and inconsistent discipline did not significantly predict subjective fear, arousal, or valence ratings during acquisition or extinction. These results are summarized in Table 3.

Early Life Stress Measures and Skin Conductance Response

When analyzing the RFQ and skin conductance response during acquisition, we found that the RFQ did not predict FIR or the whole interval SCR. For the second interval response (SIR) analysis, higher scores on the RFQ predicted larger SIR's (b= 0.01, SE= 0.002, β= 0.36, p < .05) during acquisition. The RFQ did not predict any significant first interval, second interval, or whole interval SCR's to the CS+ during extinction.

When analyzing the first interval response (FIR) during acquisition, only the teen APQ subsections of positive parenting and poor monitoring and supervision predicted the FIR. Higher scores on the teen APQ positive parenting subsection predicted smaller FIR's (b= -0.004, SE= 0.002, β= -0.37, p < .05) and the higher scores on the poor monitoring and supervision subsection predicted larger FIR's (b= 0.004, SE= 0.002, β= 0.40, p < .05). For the second interval response (SIR) analysis, the teen APQ subsections of mother's involvement, positive parenting, poor monitoring and supervision, and corporal punishment predicted SCR. Higher scores on the teen APQ mother's involvement subsection (b= -0.01, SE= 0.003, β= -0.36, p < .05) and positive parenting subsection (b= -0.41, SE= 0.14, β= -0.44, p < .01) predicted smaller SIR's during acquisition. Higher scores on the teen APQ subsections for poor monitoring and supervision (b= 0.01, SE= 0.003, β= -0.50, p < .01) and for corporal punishment (b= 0.02, SE= 0.01, β= 0.34, p < .05) predicted larger SIR's. During the whole presentation of the CS+, only

the teen APQ subsection for poor monitoring and supervision significantly predicted SCR during acquisition. Higher scores on the teen APQ poor monitoring and supervision subsection (b= 0.004, SE= 0.002, β= 0.40, p < .05) predicted larger responses to the whole CS+ presentation during acquisition. During extinction, the positive parenting and the poor monitoring and supervision subsections of the teen APQ did have significant findings. Higher scores on the teen APQ positive parenting subsection predicted smaller SIR's (b= -0.01, SE= 0.01, β= -0.39, p < .05) and higher scores on the teen APQ poor monitoring and supervision subsection predicted larger SIR's (b= 0.01, SE= 0.01, β= 0.45, p < .05) indicating a possible deficit in extinction learning.

Regression analyses were also completed to examine the relationship between the ELS measures (RFQ and teen APQ) and discrimination learning during acquisition and extinction. These results are summarized in Tables 8-10. During the first interval of CS+ presentation, the RFQ did not yield any significant findings. However, higher scores on the RFQ predicted larger discrimination during the SIR (b= 0.01, SE= 0.002, β= 0.45, p < .01) and whole interval response (b= 0.004, SE= 0.001, β= 0.44, p < .05) during acquisition. The RFQ did not significantly predict any discriminating responses during extinction.

During the first interval of CS+ presentation during acquisition and extinction, none of the APQ subsections yielded significant results (p > .05). During the second interval and over the whole interval, several subsections of the teen APQ significantly predicted discriminating responses. Higher scores on the teen APQ poor monitoring and supervision subsection predicted larger discrimination during the SIR (b= 0.01, SE= 0.003, β= 0.49, p < .01) and the whole interval response (b= 0.004, SE= 0.002, β= 0.37, p < .05) during acquisition. Higher scores on the teen APQ inconsistent discipline subsection predicted larger discrimination during the SIR

(b= 0.01, SE= 0.01, β= 0.39, $p < .05$) and the whole interval response (b= 0.01, SE= 0.003, β= 0.45, $p < .05$). Likewise, higher scores on the teen APQ corporal punishment subsection also predicted larger discrimination during the SIR (b= 0.02, SE= 0.01, β= 0.50, $p < .01$) and the whole interval response (b= 0.01, SE= 0.004, β= 0.46, $p < .05$) during acquisition (see Table 10). The only significant predictor for discrimination learning during the extinction phase was the teen APQ positive parenting subsection. Higher scores on the teen APQ positive parenting subsection predicted lower SIR discrimination learning during extinction (b= -0.01, SE= 0.003, β= -0.40, $p < .05$).

Discussion

The present study examined the effect of Early Life Stress on subjective reports of fear and physiological reactivity during a fear conditioning paradigm in a community sample of adolescents. The present study found that contrary to our hypothesis, adolescents who reported greater levels of ELS reported significantly lower subjective ratings of fear during the acquisition phase of conditioning. Concurrent with our original hypothesis, we found that higher levels of reported ELS significantly predicted higher physiological reactivity to the conditioned stimulus (CS+). Lastly, contrary to our original hypothesis that higher levels of ELS would produce deficits in discrimination learning, we found that higher levels of reported early life stress significantly predicted greater discrimination learning.

The present study found that adolescents who scored higher on the RFQ and the corporal punishment subsection of the APQ (indicating greater levels of ELS) gave lower subjective ratings of fear when asked about the CS+ during acquisition. These results indicate that contrary to their exaggerated physiological responses to the CS+, these individuals did not perceive

themselves as being more afraid of the CS+, and in fact were reporting *less* fear than adolescents who had lower levels of ELS. These results contrast with previous studies that have analyzed subjective fear ratings in clinically stressed child and adult populations (Lis et al., 2019; Waters and Pine, 2016). Previous studies found that individuals with PTSD and anxiety tend to perceive themselves as being more fearful about the CS+ and the CS- than control participants. Our findings suggest that this sample population of adolescents may not be as fearful of stressful stimuli as their clinical counterparts. While these results may seem counterintuitive, there is research that supports these findings in emotion regulation literature. Research done on avoidant individuals shows that individuals who have been classified with avoidant/repressive coping mechanisms do not recognize negative emotions consciously but still show moderate to high levels of physiological reactivity to negative and stressful stimuli (Mikulincer, 1998; Diamond, Hicks, and Otter-Henderson, 2006). This data suggests that individuals who have experienced ELS may have an enhanced ability to "tune-out" or ignore stressors compared to control populations despite their heightened physiological response.

Our results indicated that adolescents who reported higher levels of ELS on the RFQ and on the APQ subsections of poor monitoring and supervision and corporal punishment showed an increased skin conductance response (SCR) to the CS+ during acquisition while adolescents who scored higher on the positive parenting and mother's involvement subsections of the APQ showed smaller SCR's to the CS+. While these findings are consistent with research done on individuals with PTSD (Fani et al., 2012; Grillon & Morgan. 1999) and anxiety disorders (Grillon et al., 1994) they contrast with theories proposed by Lovallo (2013) and Rabinak et al. (2017); both of which propose that exposure to adverse experiences produces blunted physiological responses to stressful stimuli. The current study's results support the idea that

adverse past experiences can manifest in increased levels of physiological reactivity to current stressful experiences. One explanation for these results is that “normal” levels of family dysfunction and early life stress can contribute to the development of maladaptive stress regulatory mechanisms (Taylor et al., 2006). These results indicate that enhanced stress responses are present in this sample and suggest that even low to mid-grade familial stressors may produce deficits in emotion regulation in this population. Although these adolescents have not yet indicated clinical psychopathology, it is likely that those who reported higher levels of ELS are at a higher risk for developing physical and psychological disorders in the future. It is important to note that while these adolescents who report higher levels of ELS showed enhanced physiological responses (fear responses) to stressors, they subjectively reported lower levels of fear. This psychophysiological disconnect may have important implications for their risk of disease and prevention/intervention tactics (Diamond, Hicks, and Otter-Henderson, 2006).

Additionally, we found that the positive parenting and the poor monitoring and supervision subsections of the teen APQ predicted SCR during extinction, such that positive parenting predicted smaller responses to the CS+ and poor monitoring and supervision predicted larger SCR’s. Consistent with past studies (Fani et al., 2012, Waters, Henry, & Neumann, 2009, and Waters & Pine, 2016), these results indicated that adolescents who reported higher levels of stress were more likely to have deficits in extinction learning, meaning that not only do these teens learn about the threat more quickly (acquisition learning), but they are also slower to learn that the threat has been removed (extinction learning). Research shows that deficits in extinction learning once the threat has been removed has been implicated in the development of many forms of maladaptive psychopathology (McGuire et al., 2016) for example PTSD and GAD (Jovanovic, Kazama, Bachevalier, & Davis, 2012), and these results indicate that adolescents

who have experienced greater levels of ELS may already be experiencing these deficits. Specifically, people with these deficits struggle to inhibit conditioned fear responses despite the absence of the aversive stimulus and the presence of safety cues (Jovanovic, Kazama, Bachevalier, & Davis, 2012). In turn, these individuals can endure long-lasting fear responses greatly increasing their vulnerability for physical and emotional disease. These results suggest that the risk factors for psychopathology may be more widespread than we previously thought.

Contrary to our hypothesis, we found that adolescents who reported higher levels of ELS on the RFQ and the teen APQ subsections of poor monitoring and supervision, inconsistent discipline, and corporal punishment demonstrated greater discrimination learning between the CS+ and the CS- during acquisition. These results indicate that greater levels of ELS may enhance the adolescent's ability to learn and discriminate between threatening stimuli and nonthreatening stimuli. These results are contrary to the findings of McLaughlin et al. (2016) who found blunted discrimination learning in maltreated children and the findings from studies of individuals with PTSD by Lis et al. (2019) and Rabinak et al. (2017), which posit that individuals with stress-disorders show more generalization and less discrimination during threat learning. However, these studies were all done using strictly clinical populations and it is possible that normal to moderate levels of early life stress and family dysfunction do not have the same effect on an individual's ability to discriminate between stimuli. None of the negative parenting APQ subsections (poor monitoring and supervision, inconsistent discipline, corporal punishment) nor did the RFQ predict discrimination learning during extinction. While these results may map on to differences between clinical and subclinical adolescents, further research is necessary to resolve and clarify the relationship between adverse experiences and discrimination learning.

Several limitations of the current study must be acknowledged. Firstly, the present study had a relatively small sample size of 37 adolescents. Due to this small sample size, this study may have been underpowered to detect some effects of ELS on subjective fear ratings and physiological reactivity. This study is ongoing and will continue to collect data from additional participants in order to produce more reliable results in the future. In addition, this study was performed in an upper-class, predominantly white community, limiting the generalizability of the results. These socioeconomic factors likely also contributed to the lower than average prevalence of ELS in this population. Future research in this area should aim to study populations that are more socioeconomically diverse and populations in which ELS is more prevalent.

The analytic procedure for this study consisted of averaging SCR across several trials in acquisition and extinction in order to obtain the participants' mean SCR within each phase. While this technique has been routinely used in the literature (Lonsdorf et al., 2017), it limits the researcher's ability to analyze changes in SCR throughout the duration of each phase. For example, the researcher is unable to account for the pattern that SCR is typically higher during the first few trials before the participant has learned the association between the CS+ and the UCS and lower in the later trials once the association has been made. In regard to future research, it would be more precise to compare the responses for each trial rather than averaging across all of them. Additionally, this study design could be improved by using emotionally salient images rather than static geometric figures during fear conditioning. Studies have shown that emotional facial expressions enhance learning about the relationship between the CS+ and the UCS (Lonsdorf et al., 2009). Lastly, the only measures of ELS used in this study were self-reported questionnaires that were not independently verified. Using longitudinal and home visit

experimental methods is one way that more objective data could be obtained about parenting styles and the home environment.

Despite these limitations, this study is one of the first to examine the relationship between cumulative early life stress and physiological reactivity in a community sample of adolescents. By using cumulative measures of ELS, we were able to account for a variety of stressors present in the early environment. We found that these stressors were present in a sub-clinical sample and had significant implications on physiological reactivity, such that indicators of stress regulatory system dysregulation were already present. This study demonstrates the importance of moving towards the use of transdiagnostic approaches to identify stress-related disorders as well as the importance of early family therapeutic intervention to offset risk factors of dysregulation.

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Table 1

Means, Standard Deviations and Correlations for Demographic Variables and ELS Risk Measures

	Min:Max	Mean	Std. Dev	1	2	3	4	5	6	7	8	9	10	11
1.Gender	0;1	0.43	0.501											
2. Age	14;17	14.95	0.947	-1.11										
3. Minority	0;1	0.29	0.457	0.3	0.03									
4. Income	5;9	7.29	1.111	0.13	0.25	-0.07								
5. RFQ	.77;3.62	1.78	0.66	-0.05	0.23	-0.01	-0.05							
6. APQ INV (M)	0;33	34.26	7.16	0.32*	-0.15	0.08	0.15	-0.43**						
7. APQ INV (F)	6;33	28.6	9.32	0.16	0.39*	0.21	0.19	0.3	0.41**					
8. APQ PP	0;23	21.14	5.11	0.06	-0.16	0.18	0.11	-0.57**	0.68**	0.36*				
9. APQ PMS	2;30	20.11	5.6	0.01	0.07	0.06	0.02	0.44**	-0.41**	-0.16	-0.46**			
10. APQ ID	0;23	12.86	4.66	-0.04	0.18	0.11	-0.21	0.61**	-0.31*	-0.19	-0.25	0.46**		
11. APQ CP	0;12	6.32	2.7	0.19	0.16	0.22	-0.02	0.76**	-0.38*	-0.27	-0.43**	0.55**	0.43**	

Note: $N = 42$, * $p < .05$, ** $p < .01$. APQ, INV=involvement (M=mother, F=father), PP=positive parenting, PMS=poor monitoring and supervision, ID= inconsistent discipline, CP=corporal punishment

Table 2

Linear Regression Analyses Predicting Subjective Fear Ratings from the RFQ

	Fear Ratings in ACQ			Fear Ratings in EXT		
	b	*SE*	β	*b*	*SE*	β
RFQ	-0.10*	0.05	-0.33	-0.01	0.04	-0.04
Age	0.05	0.43	0.12	0.23	0.41	0.10
Gender	1.30	0.81	0.26	1.54	0.77	0.34
Minority	-1.12	0.87	-0.21	-0.88	0.82	-0.18
Income	-0.08	0.36	-0.03	-0.58	0.34	-0.28

Note: $N = 42$, * $p < .05$

Table 3

Individual Linear Regression Analyses Predicting Subjective Fear Ratings from the APQ Subsections

	Fear Ratings in ACQ			Fear Ratings in EXT		
	b	*SE*	β	*b*	*SE*	β
INV (M)	.09	.06	.27	.07	.05	.23
Age	-.05	.43	-.02	.30	.39	.13
Gender	.97	.86	.20	1.25	.78	.27
Minority	-1.07	.89	-.20	-.89	.81	-.18
Income	-.10	.06	.27	-.64	.34	.23
INV (F)	.05	.05	.19	-.02	.04	-.08
Age	.05	.50	.02	.13	.44	.05
Gender	1.32	.85	.27	1.55	.77	.34
Minority	-1.31	.94	-.24	-.77	.86	-.16
Income	-.14	.39	-.06	-.52	.36	-.25
PP	.14	.08	.28	.11	.07	.26
Age	-.00	.44	-.00	.35	.40	.15
Gender	1.41	.83	.29	1.60	.75	.35*
Minority	-1.38	.90	-.26	-1.15	.82	-.23
Income	-.12	.37	-.06	-.67	.33	-.33
PMS	-.10	.07	-.22	-.11	.06	-.26
Age	-.13	.43	-.05	.25	.38	.10
Gender	1.31	.84	.27	1.51	.74	.33*
Minority	-.98	.90	-.18	-.80	.80	-.16
Income	.01	.37	.00	-.56	.33	-.27
ID	-.08	.09	-.16	.02	.08	.03
Age	-.07	.45	-.03	.20	.41	.08
Gender	1.33	.85	.27	1.54	.77	.34
Minority	-.98	.91	-.18	-.89	.83	-.18
Income	-.10	.39	-.04	-.56	.35	-.27

CP	-.41**	.14	-.44	-.26	.13	-.31
Age	.06	.41	.02	.36	.39	.15
Gender	1.70	.78	.34*	1.77	.74	.39*
Minority	-.69	.84	-.13	-.64	.79	-.13
Income	-.07	.34	-.03	-.61	.32	-.30

Note: N = 42, * $p < .05$, ** $p < .01$. APQ, INV=involvement (M=mother, F=father), PP=positive parenting, PMS=poor monitoring and supervision, ID= inconsistent discipline, CP=corporal punishment

Table 4

Regression Analyses Predicting SCR from RFQ during Acquisition

	CS+ FIR			CS+ SIR			CS+ Whole		
	b	*SE*	β	*b*	*SE*	β	*b*	*SE*	β
RFQ	.00	.00	.23	.01*	.00	.36	.00	.00	.22
Age	.00	.01	.04	.00	.02	.04	.01	.01	.10
Gender	-.02	.02	-.15	.06	.04	.26	.02	.02	.16
Minority	-.00	.02	-.09	-.05	.05	-.17	.01	.03	.08
Income	-.00	.01	-.05	-.03	.02	-.28	.00	.00	.23

Note: $N = 37$, * $p < .05$, ** $p < .01$

Table 5

Regression Analyses Predicting SCR from APQ Subsections during Acquisition

	CS+ FIR			CS+ SIR			CS+ Whole		
	b	*SE*	β	*b*	*SE*	β	*b*	*SE*	β
INV (M)	-.00	.00	-.23	-.01	.00	-.36*	-.00	.00	-.07
Age	.00	.01	.07	.01	.02	.09	.01	.01	.14
Gender	.22	.02	.22	.09	.05	.36	.02	.03	.19
Minority	-.01	.02	-.09	-.05	.05	-.17	.01	.03	.09
Income	-.00	.00	-.23	-.03	.02	-.27	.00	.01	.01
INV (F)	.00	.00	-.02	-.00	.00	-.10	-.00	.00	-.09
Age	.00	.01	.08	.01	.03	.08	.01	.01	.11
Gender	.02	.02	.16	.07	.05	.27	.02	.02	.16
Minority	-.01	.02	-.07	-.04	.05	-.13	.02	.03	.12
Income	-.00	.01	-.05	-.03	.03	-.26	.00	.01	.05
PP	-.00	.00	-.37*	-.01	.00	-.50**	-.00	.00	-.27
Age	.00	.01	.02	.00	.02	.02	.01	.01	.10
Gender	.01	.02	.12	.06	.04	.22	.02	.02	.14
Minority	-.00	.02	-.04	-.03	.04	-.10	.02	.03	.12
Income	.00	.01	.00	-.03	.02	-.21	.00	.01	.05
PMS	.00	.00	.40*	.01	.00	.50**	.00	.00	.40*
Age	.00	.01	.07	.01	.02	.09	.01	.01	.12
Gender	.02	.02	.17	.07	.04	.29	.02	.02	.17
Minority	-.02	.02	-.13	-.06	.04	-.22	.01	.02	.04
Income	-.00	.01	-.08	-.04	.02	-.34	-.00	.01	-.02
ID	.00	.00	.23	.01	.01	.29	.01	.00	.33
Age	.00	.01	.03	.01	.02	.04	.00	.01	.06
Gender	.02	.02	.15	.07	.05	.27	.02	.02	.15
Minority	-.01	.02	-.12	-.05	.05	-.20	.01	.03	.04
Income	-.00	.01	-.03	-.03	.02	-.27	.00	.01	.05

CP	.00	.00	.23	.02	.01	.40*	.01	.00	.33
Age	.00	.01	.05	.01	.02	.05	.01	.01	.09
Gender	.01	.02	.11	.05	.04	.19	.01	.02	.09
Minority	-.01	.02	-.11	-.06	.05	-.21	.01	.03	.05
Income	-.00	.01	-.03	-.03	.02	-.26	.00	.01	.04

Note: $N = 37$, * $p < .05$, ** $p < .01$. APQ, INV=involvement (M=mother, F=father), PP=positive parenting, PMS=poor monitoring and supervision, ID= inconsistent discipline, CP=corporal punishment

Table 6

Regression Analyses Predicting SCR from RFQ during Extinction

	CS+ FIR			CS+ SIR			CS+ Whole		
	b	*SE*	β	*b*	*SE*	β	*b*	*SE*	β
RFQ	.00	.00	-.04	.00	.00	.10	-.00	.00	-.07
Age	-.01	.02	-.05	.01	.03	.04	-.00	.02	-.05
Gender	-.06	.04	-.31	-.04	.07	-.11	-.03	.04	-.18
Minority	-.03	.04	-.15	-.09	.07	-.30	-.03	.02	-.02
Income	.01	.02	.08	-.02	.03	-.16	-.00	.02	-.22

Note: $N = 37$, * $p < .05$, ** $p < .01$

Table 7

Regression Analyses Predicting SCR from APQ Subsections during Extinction

	CS+ FIR			CS+ SIR			CS+ Whole		
	b	*SE*	β	*b*	*SE*	β	*b*	*SE*	β
INV (M)	.00	.00	.02	-.01	.01	-.36	-.00	.00	-.08
Age	-.01	.02	-.06	.00	.03	.01	-.01	.02	-.08
Gender	-.06	.04	-.31	-.01	.07	-.04	-.03	.04	-.17
Minority	-.03	.04	-.15	-.10	.07	-.28	-.03	.04	-.16
Income	.01	.02	.08	-.01	.03	-.09	-.00	.02	-.01
INV (F)	.00	.00	.10	-.00	.00	-.09	.00	.00	-.05
Age	-.00	.02	-.02	.00	.04	.03	-.01	.02	-.09
Gender	-.06	.04	-.30	-.04	.07	-.12	-.03	.04	-.20
Minority	-.04	.05	-.18	-.08	.08	-.23	-.02	.04	-.13
Income	.00	.02	.05	-.02	.04	-.12	.00	.02	.00
PP	-.00	.00	-.16	-.01	.01	-.39*	-.00	.00	-.16
Age	-.01	.02	-.10	-.00	.03	-.03	-.01	.02	-.10
Gender	-.07	.04	-.33	-.06	.07	-.17	-.03	.04	-.21
Minority	-.03	.04	-.13	-.07	.07	-.21	-.02	.04	-.13
Income	.01	.02	.12	-.01	.03	-.08	.00	.02	.01
PMS	.00	.00	.26	.01	.01	.45*	.00	.00	.20
Age	-.01	.02	-.07	.01	.03	.05	-.01	.02	-.07
Gender	-.06	.04	-.29	-.02	.06	-.08	-.03	.04	-.17
Minority	-.04	.04	-.19	-.11	.07	-.31	-.03	.04	-.18
Income	.01	.02	.05	-.03	.03	-.21	-.00	.02	-.05
ID	-.00	.01	-.13	.00	.01	.00	-.00	.00	-.15
Age	-.00	.02	-.02	.01	.03	.07	-.00	.02	-.02
Gender	-.06	.04	-.31	-.04	.07	-.11	-.03	.04	-.19
Minority	-.03	.04	-.14	-.09	.07	-.26	-.02	.04	-.14
Income	.01	.02	.08	-.02	.03	-.16	-.00	.02	-.03

CP	.00	.01	.00	.01	.01	.23	.00	.01	.10
Age	-.01	.02	-.06	.00	.03	.02	-.01	.02	-.08
Gender	-.06	.04	-.31	-.05	.07	-.16	-.03	.04	-.20
Minority	-.03	.04	-.15	-.10	.07	-.28	-.03	.04	-.16
Income	.01	.02	.09	-.02	.03	-.13	-.00	.02	-.01

Note: $N = 37$, * $p < .05$, ** $p < .01$. APQ, INV=involvement (M=mother, F=father), PP=positive parenting, PMS=poor monitoring and supervision, ID= inconsistent discipline, CP=corporal punishment

Table 8

Linear Regression Analyses Predicting Discriminative SCR from the RFQ during Acquisition

	CS+ SIR			CS+ Whole		
	b	*SE*	β	*b*	*SE*	β
RFQ	.01	.00	.45**	.00	.00	.44*
Age	.01	.02	.07	.00	.01	.00
Gender	.04	.04	.18	.02	.03	.14
Minority	-.02	.04	-.09	-.01	.03	-.05
Income	-.04	.02	-.34	-.01	.01	-.12

Note: $N = 37$, * $p < .05$, ** $p < .01$ SIR: Second Interval Response

Table 9

Linear Regression Analyses Predicting Discriminative SCR from the APQ Subsections during Acquisition

	CS+ SIR			CS+ Whole		
	b	*SE*	β	*b*	*SE*	β
INV (M)	-.00	.00	-.25	-.00	.00	-.13
Age	.02	.02	.16	.01	.01	.10
Gender	.06	.04	.26	.03	.03	.20
Minority	-.02	.05	-.08	-.01	.03	-.03
Income	-.04	.02	-.34	-.01	.01	-.12
INV (F)	-.00	.00	-.22	-.00	.00	-.17
Age	.01	.02	.09	.00	.02	.04
Gender	.04	.04	.18	.02	.03	.15
Minority	-.00	.05	-.02	.00	.03	.02
Income	-.03	.02	-.27	-.00	.01	-.07
PP	-.01	.00	-.26	-.00	.00	-.19
Age	.02	.02	.13	.01	.01	.07
Gender	.04	.04	.18	.02	.03	.15
Minority	-.01	.05	-.04	-.00	.03	-.01
Income	-.04	.02	-.32	-.01	.01	-.11
PMS	.01	.00	.49**	.00	.00	.37*
Age	.02	.02	.15	.01	.01	.08
Gender	.05	.04	.21	.02	.03	.17
Minority	-.03	.04	-.13	-.01	.03	-.08
Income	-.04	.02	-.40*	-.01	.01	-.16
ID	.01	.01	.39*	.01	.00	.45*
Age	.01	.02	.07	-.00	.01	-.02
Gender	.04	.04	.19	.02	.03	.15
Minority	-.03	.04	-.13	-.02	.03	-.10
Income	-.03	.02	-.31	-.01	.01	-.08

CP	.02	.01	.50**	.01	.00	.46*
Age	.01	.02	.10	.00	.01	.03
Gender	.02	.04	.09	.01	.03	.06
Minority	-.03	.04	-.14	-.01	.03	-.09
Income	-.03	.02	-.30	-.01	.01	-.09

Note: N = 37, * $p < .05$, ** $p < .01$. APQ, INV=involvement (M=mother, F=father), PP=positive parenting, PMS=poor monitoring and supervision, ID= inconsistent discipline, CP=corporal punishment

Table 10

Linear Regression Analyses Predicting Discriminative SCR from the APQ Subsections during Extinction

	CS+ SIR			CS+ Whole		
	b	*SE*	β	*b*	*SE*	B
INV (M)	-.01	.00	-.28	.00	.00	.02
Age	-.01	.02	-.10	-.01	.01	-.22
Gender	.03	.04	.15	-.00	.03	-.02
Minority	-.09	.04	-.42*	-.05	.03	-.34
Income	-.01	.02	-.10	-.01	.01	-.12
INV (F)	-.00	.00	-.21	-.00	.00	-.12
Age	-.02	.02	-.15	-.02	.01	-.27
Gender	.02	.04	.08	-.00	.03	-.03
Minority	-.07	.05	-.34	-.04	.03	-.30
Income	-.01	.00	-.21	-.00	.01	-.07
PP	-.01	.00	-.40*	-.00	.00	-.30
Age	-.02	.02	-.15	-.02	.01	-.30
Gender	.01	.04	.04	-.01	.03	-.06
Minority	-.08	.04	-.40	-.04	.03	-.30
Income	-.01	.02	-.08	-.00	.01	-.05
PMS	.00	.00	.17	-.00	.00	-.11
Age	-.01	.02	-.06	-.01	.01	-.21
Gender	.02	.04	.11	-.00	.03	-.02
Minority	-.09	.04	-.43*	-.05	.03	-.33
Income	-.02	.02	-.18	-.01	.01	-.10
ID	-.01	.01	-.22	-.00	.00	-.35
Age	.00	.02	.01	-.01	.01	-.12
Gender	.02	.04	.09	-.00	.02	-.02
Minority	-.08	.01	-.38	-.04	.03	-.30
Income	-.02	.02	-.17	-.01	.01	-.13

CP	.01	.01	.27	.00	.00	.03
Age	-.01	.02	-.11	-.01	.01	-.22
Gender	.01	.04	.04	-.00	.03	-.02
Minority	-.09	.04	-.43*	-.05	.03	-.34
Income	-.01	.02	-.13	-.01	.01	-.11

Note: N = 37, * $p < .05$, ** $p < .01$. APQ, INV=involvement (M=mother, F=father), PP=positive parenting, PMS=poor monitoring and supervision, ID= inconsistent discipline, CP=corporal punishment