Resilient Adaptation in Maltreated Children: Identifying Opportunities for Recourse Following Maltreatment

Abstract: Each year within the United States, nearly 700,000 children experience maltreatment. In physical, emotional, social, academic, and economic terms, the cost of child maltreatment is debilitating to its survivors. The study of resilience, or the ability to achieve positive outcomes despite severe adversity, serves as the key to mitigating child maltreatment's devastation of individuals and its reproduction within communities. Using 2005 data acquired from the National Data Archive on Child Abuse and Neglect, the present study inquires: How do the status, severity, and age of onset of maltreatment, as well as individual characteristics of withdrawal, aggression, and likability, associate with ego-resiliency? We hypothesize that there is an association between whether a child has been maltreated and whether he/she has a positive level of ego-resiliency; that children who have been more severely maltreated display lower ego-resiliency; that children who possess later ages of maltreatment onset display greater ego-resiliency; that ego-resiliency is positively associated with likability; and that ego-resiliency is negatively associated with withdrawal and aggression. We found that there is sufficient evidence to suggest maltreated children possess lower ego-resiliency than non-maltreated children and that ego-resiliency is positively associated with likability and negatively associated with withdrawal and aggression. However, there was insufficient evidence to substantiate our hypotheses that greater maltreatment severity and younger age of maltreatment onset are associated with lower ego-resiliency. From these findings, we conclude that maltreated children who are perceived as more aggressive, more withdrawn, and less 'likable' should be a foremost target of intervention.

Background and Introduction:

Child maltreatment is defined by the Center for Disease Control as "any act or series of acts of commission or omission by a parent or other caregiver that results in harm, potential for harm, or threat of harm to a child," wherein acts of commission include physical, sexual, and psychological abuse, and acts of omission include a failure to supervise and provide for a child's physical, medical, emotional, and educational needs (Leeb et al., 2008). In the United States, the risk for child maltreatment is salient, with an estimated 41.5% of children experiencing supervision neglect, 11.8% experiencing physical neglect, 28.4% experiencing physical assault, and 4.5% experiencing contact sexual abuse (Hussey et al., 2006). The associated acute and longitudinal outcomes of child maltreatment are overwhelmingly negative, with sequelae including aggression, antisocial behavior, delinquency, post-traumatic stress disorder, high-risk sexual behavior, substance abuse, poor physical health, and greater mortality in adulthood (Fang et al., 2012; Leeb et al., 2008). Accounting for medical costs, child welfare costs, criminal justice costs, educational accommodations, and lost lifetime productivity, the burden to the national economy is approximated to be $585 billion (Fang et al., 2012). In both the language of human suffering and absolute economic terms, the cost of child maltreatment is crippling.

In confronting the devastation wrought by child maltreatment and the persistent intergenerational mobility of such trauma, the study of resilience provides a locus of consolation, and moreover, of recourse. The existing body of risk and resilience literature maintains that within any population of at-risk children, only about one-third will experience substantial negative outcomes following a major developmental disruption (Wolin & Wolin, 1995, as cited by Fraser, 2001). That is to say, the majority of children are resilient—able to achieve positive outcomes in spite of severe adversity (Fraser, 2001). What, then, differentiates the resilient two-thirds from the non-resilient one-third? How does the same trauma yield such vastly different outcomes among individuals? To answer these questions is to know the makings of the safe and healthy individual, to render visible those most vulnerable to poor outcomes, and ultimately, to construct effective means of individual and community-level intervention.

A rigorous apprehension of resilience serves as the key to attenuating the poor emotional, behavioral, physical, social, academic, and economic outcomes of child maltreatment. Previous research suggests that ego-resiliency predicts resilient adaptation in maltreated children, with ego-resiliency defined as an individual's capacity to adapt to a volatile environment (Cicchetti, 2012). Thus, our proposed inquiry addresses the following questions: How are the status, severity, and age of onset of maltreatment associated with ego-resiliency? Moreover, how are withdrawal, aggression, and likability associated with ego-resiliency (while adjusting for each other and for whether a child was maltreated)?

We hypothesize that there is an association between whether a child has been maltreated and whether he/she has a positive level of ego-resiliency. Furthermore, we expect that children who have experienced more severe maltreatment display lower levels of ego-resiliency, and that children who possess later ages of maltreatment onset display higher levels of ego-resiliency. Lastly, we expect ego-resiliency to be positively associated with likability and negatively associated with withdrawal and aggression.

Methodology:

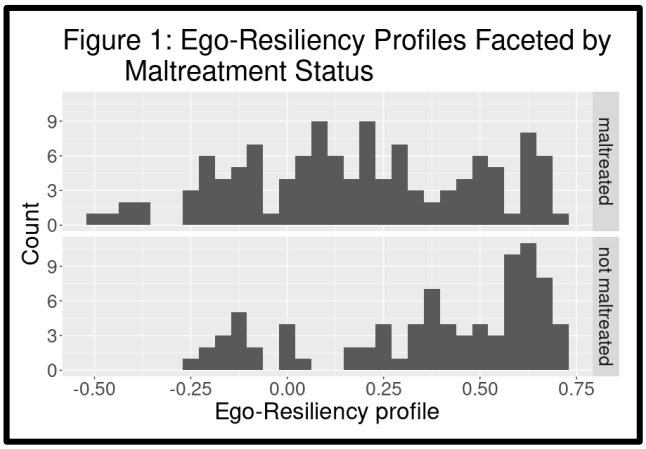
Data & Variables. We used the *Longitudinal Pathways to Resilience in Maltreated Children* dataset from the National Data Archive on Child Abuse and Neglect to form our analysis cohort. In all, we analyzed data from 300 racially and ethnically diverse participants ranging between 7.7 and 13.9 years of age. Approximately half of our cohort experienced legally documented child maltreatment (N= 168). The original data includes 160 variables. Variables pertinent to the present inquiry include maltreatment status (whether a child has been maltreated or not), ego-resiliency (sorted on a scale from -1 to +1), maltreatment severity (sorted on a scale from 1 to 5), Pupil Evaluation Inventory (PEI) aggression, withdrawal, and likability scores, and age of onset—a variable of our own creation. The original data coded the temporal details of documented maltreatment as a system of binary operators. We created the categorical age of onset variable from this binary data to stratify participants according to when their first maltreatment experience occurred, proving more useful for our analysis.

Status & Severity of Maltreatment. To investigate the bearing of maltreatment status and severity on ego-resiliency, we first visualized the distribution of ego-resiliency between maltreated vs. non-maltreated

children. Thereafter, we constructed a two-sample t-test to determine if there is sufficient evidence to suggest a difference in mean ego-resiliency between maltreated and non-maltreated children. We then performed a chi-square test to evaluate whether there is sufficient evidence demonstrating an association between maltreatment status and positive ego-resiliency and an additional two-sample t-test to examine whether children who have been severely maltreated possess a lower mean ego-resiliency than those who have been less severely maltreated. The Bonferroni-Holm method was applied to the p-values throughout all presented analyses to control for the potential inflation of type 1 error rate (See Appendix A).

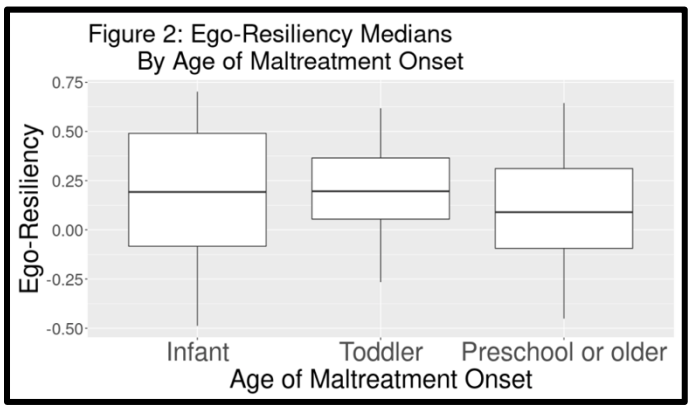
Age of Maltreatment Onset. To guide our study of the interaction between age of maltreatment onset and ego-resiliency, we visualized a distribution of our cohort's ego-resiliency faceted by age of maltreatment onset. Due to ANOVA normality assumptions not being satisfied (See Appendix B), we conducted a Kruskal-Wallis test to determine whether there exists sufficient evidence to suggest at least one group difference in median ego-resiliency based on age of onset.

Aggression, Withdrawal, & Likability. To explore how individual characteristics of aggression, withdrawal, and likability compare among maltreated and non-maltreated children, we calculated point estimates of the mean aggression, withdrawal, and likability scores for our maltreated and non-maltreated subsets. We then crafted three two-sample t-tests, informed by our point estimates, to determine if there is sufficient evidence to suggest that maltreated children possess greater levels of aggression and withdrawal, and lower levels of likability in relation to non-maltreated children. To quantify the predictive value of aggression, withdrawal, and likability on ego-resiliency while controlling for each of these factors and maltreatment status, we constructed a linear regression model.



Results:

Status & Severity of Maltreatment. As observed in Figure 1, children who have experienced maltreatment generally possess lower ego-resiliency than children who have not. In corroboration with Figure 1, the results of our first t-test were statistically significant at the α=0.05 significance level ($p < 0.001$), providing sufficient evidence to suggest that maltreated children possess a lower mean ego-resiliency than non-maltreated children. However, the results of our chi-square test and second t-test were not found to be statistically significant at the α= 0.05 significance level (p= 0.105 and p= 0.770 respectively). Consequently, there is insufficient evidence to suggest that there is a relationship between maltreatment status and positive (rather than negative) levels of ego-resiliency, or that more severely maltreated children possess a lower mean ego-resiliency.



Age of Maltreatment Onset. As displayed in Figure 2, ego-resiliency medians did not seem to differ based upon age of maltreatment onset—contrary to our initial hypothesis. The statistical insignificance of our Kruskal-Wallis test at the α= 0.05 significance level (p= 0.786) gave further credence to Figure 2: there is insufficient evidence to suggest that at least one age of onset group possesses a different median ego-resiliency than the others.

Aggression, Withdrawal, & Likability. The results of our aggression, withdrawal, and likability t-tests were all statistically significant at the α=0.05 significance level (p=0.0097, p= 0.00102, and p= 0.00129

respectively), providing sufficient evidence to suggest that maltreated children possess a greater mean aggression score, greater mean withdrawal score, and lower mean likability score compared to non-maltreated children. Having determined that all model assumptions were satisfied, we concluded that a multiple linear regression model would be appropriate for predicting ego-resiliency (See Appendix C). The linear model for predicted ego-resiliency exists as follows: *Predicted Ego-Resiliency = 0.392 - 0.021* PEI_AGG4 - 0.0528* PEI_WDR4 + 0.078* PEI_LIK4 - 0.047* maltreated.* Within this multiple regression model, our predictor variables were aggression, withdrawal, and likability. Adjusting for these factors and for maltreatment status, each was associated with low ego resiliency. However, only the aggression, withdrawal, and likability relationships were statistically significant at the α=0.05 significance level ($p < 0.001$ for aggression, withdrawal, and likability and $p= 0.288$ for maltreatment status).

Discussion:

In terms of the interaction between maltreatment status and ego-resiliency, our findings support the conclusion that children who have been maltreated possess a lower ego-resiliency than children who have not been maltreated. However, we were unable to find sufficient evidence to uphold our initial claims of an association between maltreatment and negative ego-resiliency levels; younger age of maltreatment onset and lower ego-resiliency; or more severe maltreatment and lower ego-resiliency.

Congruous with the existing body of literature and our hypotheses, we found that, according to their peers, maltreated children were more aggressive, more withdrawn, and less liked than non-maltreated children. Because a child's interactions with his or her peers constitute the single greatest social force beyond the familial context and provide one's first exposure to the arena of work, competitive, and social demands which are indivisible from the human experience, peer evaluations provide powerful predictors for a child's acute and longitudinal adjustment (Pekarik et al., 1976). Thus, our findings are particularly sobering in that the aggression, social withdrawal, and decreased likability characteristic of maltreated children place them at significant risk for peer rejection—rejection which in turn correlates with psychopathology, delinquency, and low educational attainment (Bolger & Patterson, 2001).

Aggression, withdrawal, and likability similarly possess important implications for ego-resiliency, as supported by our linear regression model. It is important to note, however, that there was insufficient evidence to support maltreatment status as a statistically significant predictor of ego-resiliency: suggesting that the behavioral sequelae of maltreatment, rather than maltreatment status itself, are most salient in the pathway to ego-resilience. The same features of heightened aggression, heightened withdrawal, and lower likability attributed to maltreated children by their peers are predictive of lower levels of ego-resiliency, consistent with our findings that our sample of maltreated children possessed lower ego-resiliency than non-maltreated children. It is clear: maltreated children who exhibit heightened levels of aggression and social withdrawal with lower levels of likability are at the greatest acute and lifelong risk. Our charge, too, is clear: having identified this risk, we must intervene with protection; within the maltreated subset, these children must be a foremost target of intervention.

There exist numerous limitations to our research. Though we observed statistically significant relationships between maltreatment status, aggression, withdrawal, likability, and ego-resiliency, the magnitude of these effects cannot be derived from our present analysis. Our analysis, furthermore, did not account for a child's gender, the form, nor the duration of maltreatment experienced, leaving us unaware of the ways in which gender interacts with specific maltreatment experiences to predict ego-resiliency. Lastly, because our data is observational, it is beyond the scope of our analysis to make causative statements regarding the relationship between maltreatment status, aggression, withdrawal, likability, and ego-resiliency. In light of prior evidence that suggests boys and girls occupy different social worlds that present different etiologic risks, it stands to reason that a successful intervention to promote ego-resiliency must be gender-aware (Cullerton-Sen et al., 2008). Therefore, future research should be targeted towards clarifying how demographic differences, notably gender, factor into the mechanistic pathways from certain maltreatment experiences—physical, sexual, or psychological—to aggression, withdrawal, likability, and ultimately, ego-resiliency.

References

Bolger, K. E., & Patterson, C. J. (2001). Developmental Pathways from Child Maltreatment to Peer Rejection. Child Development, 72(2), 549-568. doi:10.1111/1467-8624.00296

Cicchetti, D., Rogosch, F., Manly, J.T., Lynch, M. (2005). Longitudinal Pathways to Resilience in Maltreated Children [Dataset]. Available from National Data Archive on Child Abuse and Neglect Web site, http://www.ndacan.cornell.edu

Cicchetti, D. (2012). Annual Research Review: Resilient functioning in maltreated children - past, present, and future perspectives. Journal of Child Psychology and Psychiatry, 54(4), 402–422. https://doi.org/10.1111/j.1469-7610.2012.02608.x

Cullerton-Sen, C., Cassidy, A. R., Murray-Close, D., Cicchetti, D., Crick, N. R., & Rogosch, F. A. (2008). Childhood maltreatment and the development of relational and physical aggression: the importance of a gender-informed approach. Child development, 79(6), 1736–1751. https://doi.org/10.1111/j.1467-8624.2008.01222.x

Fang, X., Brown, D. S., Florence, C. S., & Mercy, J. A. (2012). The economic burden of child maltreatment in the United States and implications for prevention. Child Abuse & Neglect, 36(2), 156–165. https://doi.org/10.1016/j.chiabu.2011.10.006

Fraser, M. W. (2001). Risk and resilience in childhood: An ecological perspective. Washington: NASW Press.

Hussey, J. M., Chang, J. J., & Kotch, J. B. (2006). Child Maltreatment in the United States: Prevalence, Risk Factors, and Adolescent Health Consequences. Pediatrics, 118(3), 933–942. https://doi.org/10.1542/peds.2005-2452

Leeb, R. T., Paulozzi, L. J., Melanson, C., Simon, T. R., & Arias, I. (2008). Child maltreatment surveillance: Uniform definitions for public health and recommended data elements. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.

Pekarik, E. G., Prinz, R. J., Liebert, D. E., Weintraub, S., & Neale, J. M. (1976). The pupil evaluation inventory. Journal of Abnormal Child Psychology, 4(1), 83-97. doi:10.1007/bf00917607

Wolin, S., & Wolin, S. (1995). Resilience Among Youth Growing Up in Substance-Abusing Families. Pediatric Clinics of North America, 42(2), 415-429. doi:10.1016/s0031-3955(16)38955-6

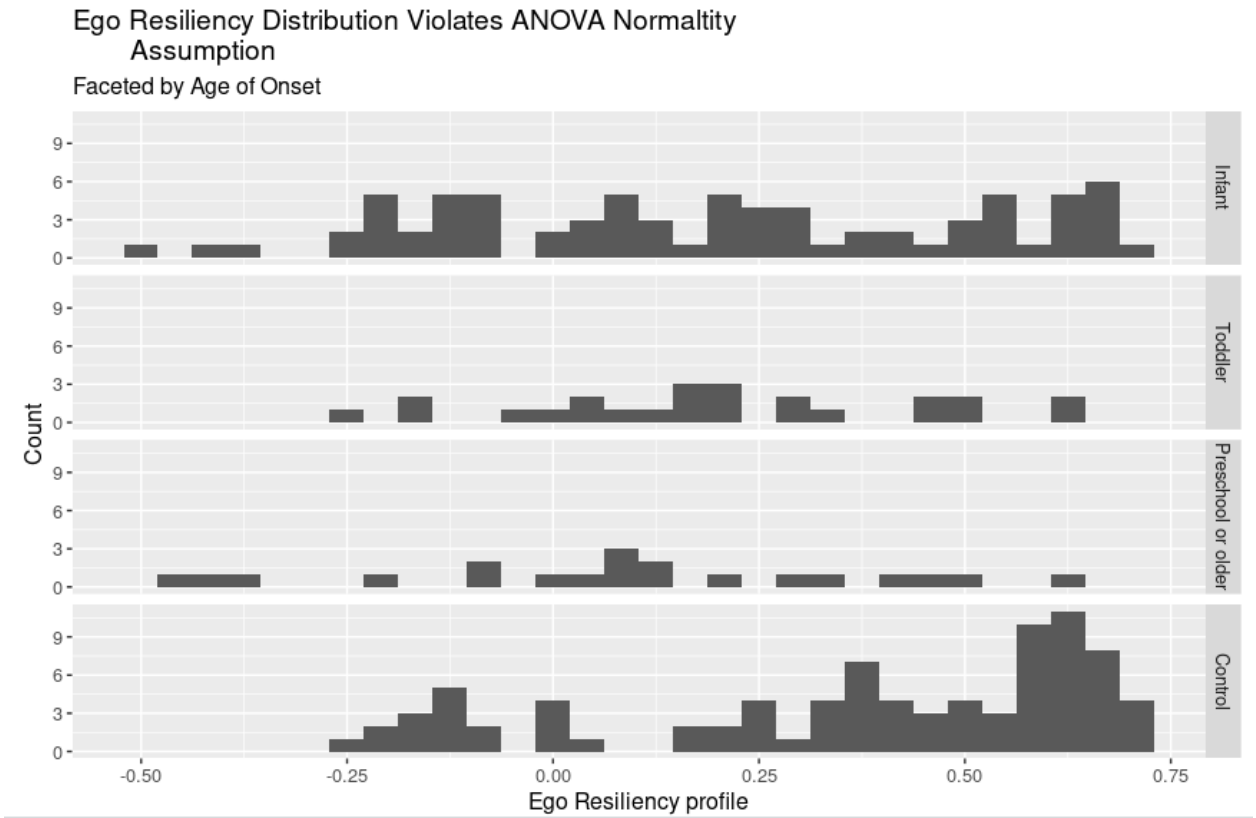
Appendix

Appendix A: Bonferroni-Holm Adjustments

Hypothesis Test #	*Test Type*	*Category of Analysis*	*Original P-Value*	*Bonferroni-Holm-Adjusted P-Value*	*Decision*
1	Two-sample t-test	Status & Severity of Maltreatment	3.42e-07	2.74e-06	Reject Null Hypothesis
2	Chi-square test	Status & Severity of Maltreatment	0.0262	0.105	Fail to Reject Null Hypothesis
3	Two-sample t-test	Status & Severity of Maltreatment	0.770	0.770	Fail to Reject Null Hypothesis
4	Kruskal-Wallis test	Age of Maltreatment Onset	0.393	0.786	Fail to Reject Null Hypothesis
5	Two-sample t-test	Aggression, Withdrawal, & Likability	0.00194	0.0097	Reject Null Hypothesis
6	Two-sample t-test	Aggression, Withdrawal, & Likability	0.000145	0.00102	Reject Null Hypothesis
7	Two-sample t-test	Aggression, Withdrawal, & Likability	0.000215	0.00129	Reject Null Hypothesis
8	Multiple Regression	Aggression, Withdrawal, & Likability	1.30e-10	1.17e-09	Reject Null Hypothesis
9	Multiple Regression	Aggression, Withdrawal, & Likability	9.56e-11	9.56e-10	Reject Null Hypothesis
10	Multiple Regression	Aggression, Withdrawal, & Likability	2.52e-11	2.77e-10	Reject Null Hypothesis
11	Multiple Regression	Aggression, Withdrawal, & Likability	0.0959	0.288	Fail to Reject Null Hypothesis

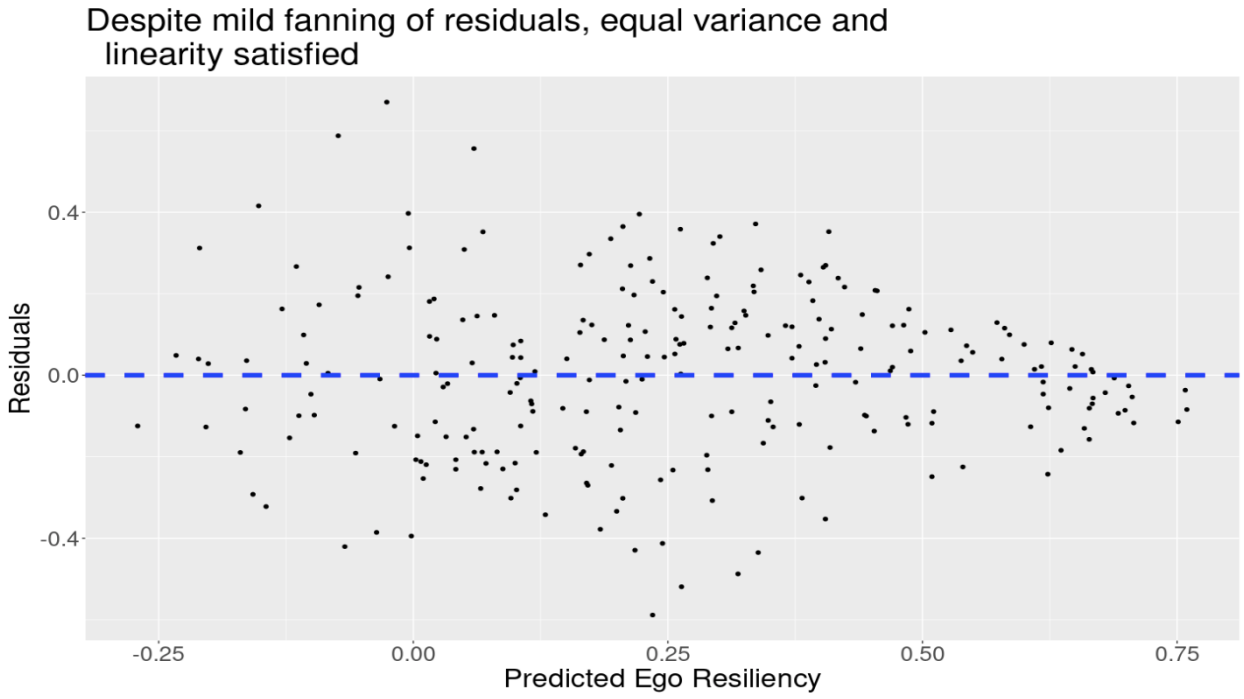
When multiple comparisons are performed on a single sample, the familywise type 1 error rate is known to be inflated in relation to the per-analysis type 1 error rate. To control for this inflation, we employed the Bonferroni-Holm method, which is not as conservative as the Bonferroni method but possesses considerably increased power. In accordance with the Bonferroni-Holm Method, we sorted the eleven p-values obtained from our analyses in increasing order. Note that the table above lists these p-values in order of appearance in our analysis, rather than increasing order. We multiplied the first and smallest p-value by eleven: the number of comparisons performed and henceforth referred to as K. We multiplied the second p-value by K-1, the third p-value by K-2, and continued in this fashion until we reached the largest p-value, which was multiplied by K-10, or 1. All adjusted p-values were compared to the α= 0.05 significance level. If the adjusted p-value was less than α= 0.05, the results of the hypothesis test were determined to be statistically significant. Likewise, if the adjusted p-value was greater than α= 0.05, the results of the hypothesis test were determined to not be statistically significant.

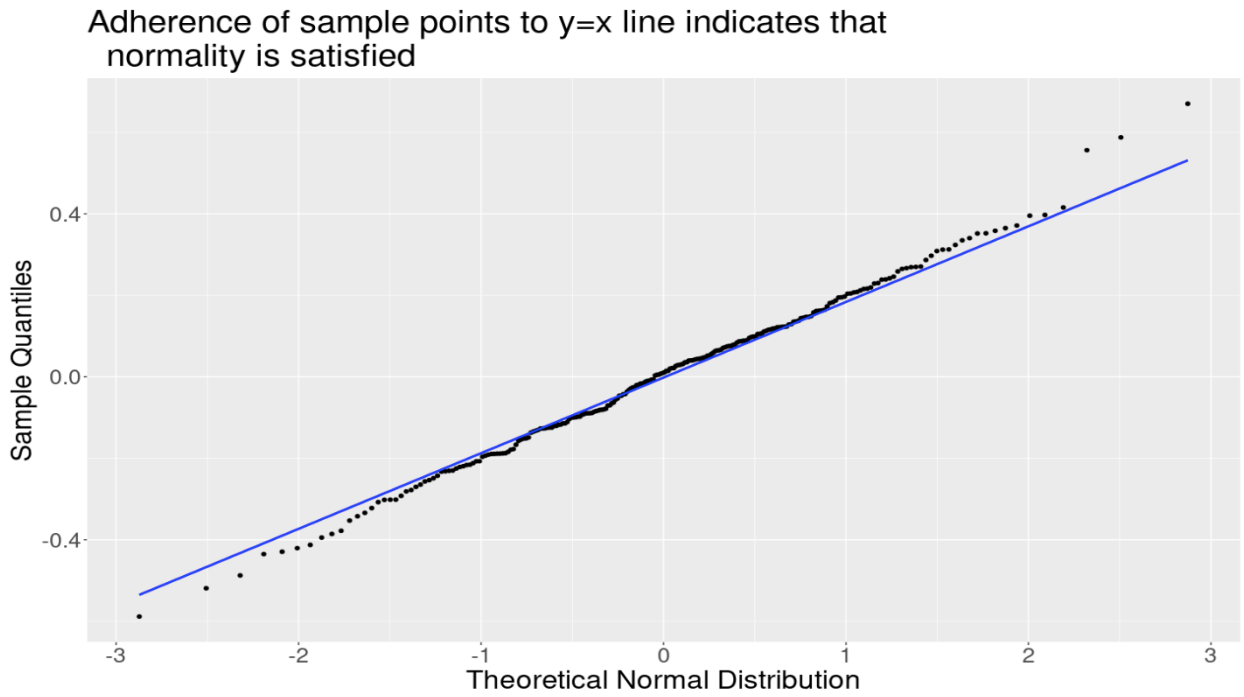
Appendix B: ANOVA Assumptions Not Satisfied



The above histogram, faceted by age of maltreatment onset, illustrates our cohort's non-normal distribution of ego-resiliency. Due to the absence of normality, ANOVA conditions are not satisfied, requiring the use of a Kruskal-Wallis test for the present analysis.

<u>Appendix C:</u> Linear Regression Assumptions Satisfied





correlation_agg_wdr <dbl>	correlation_agg_lik <dbl>	correlation_wdr_lik <dbl>
0.1488446	-0.4629981	-0.3975241

Four conditions must be met for a linear regression to be appropriate for a set of data: independence, linearity, equal variance, and normality. A linear model is indeed appropriate for the approximation of ego-resiliency, as determined by the three plots above. On the residual plot, if we were to observe a notable recurring pattern in the residuals or a dense collection of residuals at any point in the index, this would suggest that there has been a time-series violation of independence. Because we observe nothing of this sort on the plot and have confirmed that our data consists of a randomly-selected sample, there is sufficient evidence to suggest that independence is satisfied. In the second plot, the predicted ego-resiliency for each observation given our linear model is plotted on the x-axis and compared against the residuals on the y-axis. Here, we observe symmetry in the residuals about the y-intercept of the plot, which provides sufficient evidence to assume that linearity is satisfied. Although we observe a fanning in the residuals, constituting a mild violation of constant variance, this violation is not so great as to render a linear model inappropriate. Thus, we may also assume that constant variance is satisfied. On the Q-Q plot, the percentiles of our residuals are plotted on the y-axis and compared against the theoretical normal distribution as plotted on the x-axis. Because the vast majority of the plot points fall along the y=x line with no glaring deviation, there is sufficient evidence to suggest that normality is satisfied. For a multiple linear regression, there exists the additional condition that the predictors cannot be too correlated with one another. This condition is satisfied, with the correlation between PEI scores of aggression and withdrawal, aggression and likability, and withdrawal and likability being being 0.149, -0.463, and -0.398 respectively. Note that maltreatment status is absolved from this correlation assessment, as it is a binary rather than continuous variable.