TWU Woodcock institute

Research Project FINAL Report

The overall objective of the funded project was to use multiple measures and methods to explore patterns of EF performance in college students with ACEs exposure. This report provides an update on our progress as of January 2020.

*Recruitment and Data Collection*

Target recruitment was 80 participants, 40 from the university participant pool (SONA, for course credit) and 40 from university campuses with monetary remuneration. We did not anticipate that so many students would complete the online questionnaire portion of the study and fail to sign up for the second portion. Part of the difficulty involved the UHCL SONA rules and procedures, which require researchers to award credit for each portion of a study completed, rather than for completion of an entire study. Additionally, we started with only one RA, who was also in school and at practicum placements over 40 hours each week. Thus, it was difficult to maintain enough in-person testing slots to keep up with demand from online completers. Thus, we requested and were granted a reallocation of budget funds to enhance our ability to recruit and test participants who would complete the entire study (both portions). Whereas we were not able to recruit as many additional participants as we anticipated over Summer 2019 with increased funds for participant remuneration, the addition of a second RA and our increased preparation time aided us in boosting recruitment significantly in the Fall 2019 semester. There continued to be an imbalance in participation rates, with far more completing the online portion of the study than the in-person testing session; however, we

Across the Spring, Summer, and Fall 2019 semesters semester, 393 participants completed online questionnaires (Part I of the study; this does not include either (a) duplicates or (b) the participants who failed to complete the questionnaire after logging into the web site). Across the same period, we also successfully recruited and tested 50 participants using WJ IV COG measures in person (Part II of the study; excluding no-shows, duplicates, 2 participants with technical difficulties during testing, etc.).

With the computerized cognitive measures on the Inquisit Millisecond platform, we encountered many technical problems. On several occasions the audio did not play during testing, the Inquisit server did not record (complete) data for the participant’s testing session (e.g., only recorded some test scores but not others though all were administered), or the iPads themselves malfunctioned during testing. In order to try to acquire as much data as possible, we instructed some participants to complete the Inquisit measures at home when technical difficulties arose in the lab. We also instructed ALL Fall 2019 participants to do these measures at home, given the frequency and pervasiveness of our in-session technical problems. Because of these difficulties and inconsistencies, we consider the data acquired from Inquisit computerized EF measures invalid for reporting at this time. We did find great value, however, in evaluating the technical capabilities and procedural requirements for these measures and hope to adjust our protocol to the difficulties encountered for future studies.

*Analyses and Results*

1. Do the number of types of ACEs (multiplicity) and ACEs severity predict EF performance across multiple measures?
   1. Hypothesis: Consistent with previous research, number of types of ACEs exposure (multiplicity) will significantly predict scores on all EF measures.

**Results of correlation analyses indicate that the number of types of ACEs participants report having experienced (MAES multiplicity score) is significantly associated with total scores on all three EF behavior rating scales (n = 371; BDEFS r = .28; BRIEF GEC r = .31; ESQ-R r = .25; p < .01). The more types of ACEs participants reported childhood exposure to, the greater their self-reported EF difficulties at present.**

**However, multiplicity scores were not significantly associated with EF scores on the direct neuropsychological tests from the WJ IV COG designated in previous literature as most likely to measure EF (n = 43; WJ IV COG Number Series r = .21; Verbal Attention r = -.09; Visualization r = .20; Number Reversed r = .14).**

* 1. Hypothesis: Overall ACEs severity will significantly predict EF performance across measures.

**Results of correlation analyses indicate that the severity of ACEs participants report having experienced (MAES severity/summary score) is significantly associated with total scores on all three EF behavior rating scales (*n* = 371; BDEFS *r* = .29; BRIEF GEC *r* = .34; ESQ-R *r* = .27; *p* < .01). The more severe the ACEs participants reported childhood exposure to, the greater their self-reported EF difficulties at present.**

**Contrary to our hypothesis, however, multiplicity scores were not significantly associated with EF scores on the direct neuropsychological tests from the WJ IV COG designated in previous literature as most likely to measure EF (*n* = 43; WJ IV COG Number Series *r* = .20; Verbal Attention *r* = -.14; Visualization *r* = .20; Number Reversed *r* = .06).**

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**Overall, therefore, Hypothesis #1 was not supported. It is likely, however, that disproportionately small sample sizes for the direct neuropsychological test analyses impacted these results, given the fact that small sample sizes limit power to detect statistically significant relationships among variables.**

**Interestingly, the positive valence of some of these correlations is in the opposite direction from that which was expected. Specifically, those with higher ACEs scores appear to have had higher standard scores on several WJ IV COG subtests.**

1. Does the relationship between ACEs and EF vary as a function of measurement method?
   1. Hypothesis: In line with previous research showing stronger convergent validity among self-report EF measures than direct EF tasks (Duckworth & Kern, 2011), and an average correlation of *r* = .19 between direct EF tasks and EF rating scales (Toplak et al., 2013), ACEs multiplicity and severity will be more strongly associated with self-report EF rating scale scores than on direct EF tasks.

**Based on the correlations reported above, this hypothesis was supported. ACEs multiplicity and severity scores were more strongly (and statistically significantly) correlated with EF scores on self-report behavior rating scales than on direct neuropsychological tests.**

**Further, of the four WJ IV COG tests administered that were previously hypothesized as most likely to measure EF (Decker et al., 2017), only one showed significant correlations with scores on an EF behavior rating scale in the current sample: Participant scores on Verbal Attention from the WJ IV COG showed a significant correlation with total scores on the BDEFS (*r* = -.30,  *p* = .04, *n* = 49). Correlations between Verbal Attention scores and the other self-report EF behavior rating scale scores were similar in magnitude but not statistically significant (BRIEF GEC *r* = -.28,  *p* = .06, *n* = 49; ESQ-R *r* = -.21,  *p* = .14, *n* = 49).**

**Again, these differences may be at least partially explained by differences in sample size (and therefore variance) across rating scale vs. direct measures.**

1. Does ACEs exposure relate more strongly to some EF components than others?
   1. Hypothesis: ACEs exposure and EF will be more strongly related to scores on hot EF components (Welsh et al., 2017) than cold components, on both direct performance tasks and rating scales. ACEs relationships with different cold components will be similar.

**Because of a high frequency of technical difficulties with the “hot” EF measures on the Inquisit platform, we were unable to examine this hypothesis. We hope to continue collecting data using the Inquisit measures to clarify this question. The perpetual subscription to Inquisit through this grant will allow us to continue to work through the technical problems presented by this new technology.**

1. What is the pattern of relationships between ACEs exposure and EF on the WJ IV COG?
   1. Hypothesis: Based on Decker et al. (2017), ACEs will be more strongly related to scores on WJ IV tasks thought to be most impacted by EF (Tests 2 Number Series, 3 Verbal Attention, 7 Visualization, and 10 Numbers Reversed) than on those with some involvement (Tests 4 Letter-Pattern Matching, 5 Phonological Processing—Word Fluency measure only, 6 Story Recall, and 9 Concept Formation).

**Based on the current results, this hypothesis was not supported in our sample. In fact, ACEs exposure was associated more strongly with some non-“EF” WJ IV COG subtests than with those Decker et al. (2017) previously hypothesized as likely measuring EF. The table below shows the correlation patterns of ACEs number of types of exposure (Multiplicity) and severity with WJ IV COG subtests. Green cells represent those subtests previously hypothesized to best measure EF, followed by yellow columns showing those that were hypothesized to involve some EF, and blank columns that were administered as “non-EF” measures of verbal IQ. The strongest correlation between WJ IV COG subtest scores and ACEs measures was on the Concept Formation test (Gf; also the only statistically significant correlation in this sample and analysis), followed by Number Series and Visualization. Curiously, these correlations were all in the opposite direction from that expected, though. According to these results, participants with exposure to more types of/more severe ACEs had *higher* cognitive functioning on these subtests (positive correlation). Tests like Verbal Attention showed the expected pattern of negative correlation with ACEs scores, but with weaker magnitude.**

***Correlations among Trauma Exposure (MAES) and WJ IV COG Subtest Scores***

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***N* = 43** | | **GIA** | **Oral Vocabulary** | **Number Series** | **Verbal Attention** | **Letter-Pattern Matching** | **Phonological Processing** | **Story Recall** | **Visualization** | **General Information** | **Concept Formation** | **Numbers Reversed** |
| **MAES Multiplicity** | ***r*** | **0.09** | **-0.07** | **0.21** | **-0.08** | **0.03** | **-0.04** | **0.03** | **0.20** | **0.06** | **0.33\*** | **0.14** |
| ***p*** | 0.58 | 0.67 | 0.17 | 0.59 | 0.84 | 0.82 | 0.83 | 0.19 | 0.70 | **0.03** | 0.38 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **MAES Severity** | ***r*** | **0.06** | **-0.10** | **0.19** | **-0.14** | **0.04** | **-0.02** | **-0.02** | **0.20** | **0.04** | **0.27** | **0.06** |
| ***p*** | 0.70 | 0.53 | 0.23 | 0.38 | 0.78 | 0.88 | 0.92 | 0.21 | 0.77 | 0.08 | 0.69 |

*Budget and Expenditures*

We were originally awarded $13,000 for participant remuneration, personnel, and equipment and supplies. We requested and were granted budget revisions in Spring 2019. Amounts spent in each major category appear in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Final Report: Amount Spent** | | | | | |
| **Expense** | **Quantity** | **Cost per 1** | **Estimated Cost** | **Amount Spent** | **Notes** |
| **Participant remuneration** | $ 50.00 | $ 50.00 | $ 2,500.00 | $ 250.00 |  |
| **Personnel** |  |  |  |  |  |
| Graduate Research Assistants (Salary + Fringe Benefits for 3 semesters) |  |  | $ 6,376.50 | $ 5,295.90 |  |
| **Supplies & Equipment** |  |  |  |  |  |
| BRIEF-Adult PAR (per participant) | $ 199.00 | $ 4.90 | $ 975.10 | $ 465.50 |  |
| additional BRIEF-A administrations | $ 331.00 | $ 4.90 | $ 1,621.90 | *$ 1,621.90* | *\*pending invoice (not yet paid)* |
| BDEFS Qualtrics administration | $ 500.00 | $ 1.00 | $ 500.00 | *$ 500.00* | *\*pending invoice (not yet paid)* |
| Millisecond Inquisit Web + Lab license | $ 1.00 | $ 3,145.00 | $ 3,145.00 | $ 3,145.00 |  |
|  |  |  |  |  | **Remaining (not spent):** |
| **TOTALS** |  |  | Anticipated total amount spent (after invoices all paid) | *$ 11,278.30* | *$ 1,721.70* |
| **Original award: $13,000** |  |  | **current** total amount spent WITHOUT pending unpaid invoices | **$ 9,156.40** | **$ 3,843.60** |

\**These invoices are in the payment process as of 1/21/2020. According to the UHCL HSH Business Office, reconciliation reports from Accounting will not reflect these numbers until a February reconciliation report. The most recent reconciliation report is attached.*

*Dissemination of Results and Future Directions*

These results are currently serving as doctoral theses for two students and dissertation data for two other students. The results have been accepted for presentation at SWPA for April 2020. Students will also present results at the University’s in-house research conference in April 2020. We will propose remaining analyses/interpretations for presentation at NASP and/or APA next year, as well as TASP and/or SWPA. We have conducted these preliminary analyses and are continuing to explore additional variables, interactions/possible moderators, etc. for further interpretation. We have written up the Methods and Results for publication and, once the Intro and Discussion sections are completed, will submit the first manuscript for publication in Spring/Summer 2020. We anticipate writing up and submitting several publications from this data, including one focusing on EF and trauma, another on mindfulness and trauma, and another on internalizing symptoms (anxiety, depression, and stress) and EF and trauma.