

## *Supplementary Material*

# **A Systematic Review of Amenable Resilience Factors that Moderate and/or Mediate the Relationship between Childhood Adversity and Mental Health in Young People**

Jessica Fritz\*, Anne M. de Graaff, Helen Caisley, A.-L. van Harmelen<sup>A</sup> & Paul O. Wilkinson<sup>A</sup>

\* **Correspondence:** Jessica Fritz: [jf585@cam.ac.uk](mailto:jf585@cam.ac.uk)

<sup>A</sup> **Shared last authorship**

## **1 Supplementary Description**

### **1.A**

The inter-rater reliability (IRR) calculation was based on nominal agreement ratings (1 = correct, 0 = incorrect), and was conducted in R with the ‘epiR’ package (1). Given that the data indicated prevalence problems (i.e. marginal distribution of the agreement ratings were substantially more often “correct” than “incorrect” ,2), we utilized Byrt’s prevalence-adjusted kappa (3). We calculated Byrt’s kappa separately for every abstracted article and averaged the revealed kappas.

### **1.B**

We report the gender ratio for the baseline assessment or the investigated sample. If such information was not available we report information for the first reported assessment time. We report the average, not the absolute, study length and in cases of uncertainty we report the minimal length of the studies. We report the sample sizes which have been used for the analyses. We report the mean ages for the CA assessments, dependent on availability either for the full or for the investigated sample. CA assessment mean ages were provided for 12 of the 22 studies.

### **1.C**

Notably, ego over-control mediated the association between early child maltreatment and alcohol use negatively (4). A lower level of early child maltreatment was associated with less ego over-control and a low level of ego over-control was in turn associated with more alcohol use (4). Given the negative mediation, we did not consider this effect as RF.

### **1.D**

Notably, adolescent-father communication negatively mediated the association between paternal alcohol abuse problems and violation of rules, in girls (5). A lower level of CA was associated with more adolescent-father communication and more adolescent-father communication was in turn associated with more violation of rules (5). Given the negative mediation effect, we did not consider this effect as RF.

## 2 Supplementary Table

The data extraction form was partially underpinned by the STROBE report recommendations (6). The data extraction form covers the following topics: (a) Type of cohort design, (b) length of follow-up period (including time intervals), (c) definition of CA (theoretical and statistical scale used), (d) sample size (if possible per group and assessment occasion), (e) gender, (f) age, (g) demographics (i.e. socio-economic status & ethnicity), (h) measurement type (e.g. questionnaire/interview/objective measure), assessment instrument, and assessment time point for CA, (i) measurement type, assessment instrument, and assessment time point for RF(s), (j) measurements type, assessment instrument, and assessment time point for psychopathology (PP), (k) type (i.e. design/statistics/other) and definition for controlled confounders, (l) used statistics and statistical outcome (i.e. moderation/mediation, analysis method, analysis coefficient, analysis statistic, significance value, confidence interval/standard error, effect size), and (m) conclusion (significance and if appropriate directionality of the effect).

### *Data extraction item content template.*

Item	Item content
1	Reference
2	ID
3	Note
4	Design
5	Note Design
6	Amount of assessment waves
7	Either indicate the time point for each assessment wave (e.g. T1 January 2010, T2 March 2013; or: T1 age 14, T2 age 17) or the incubation time between the assessments (e.g. T1: baseline, T2: T1 + 3 years, T3: T1 + 5 years)
8	Gender
9	CA definition
10	CA measurement
11	If CA dichotomous: define control group
12	Sample size (if possible per occasion; e.g. T1 = 600, T2 = 490)
13	If CA dichotomous: Sample size per group (and if possible per occasion; e.g. CA: T1 = 320, T2 = 170; no-CA: T1 = 500, T2 = 400)
14	Mean age (if possible per occasion; e.g. T1 = 14.5, T2 = 17.1)
15	Note age
16	If CA dichotomous: Mean age per group (and if possible per occasion; e.g. CA: T1 = 14.2, T2 = 17.0; no-CA: T1 = 14.8, T2 = 17.6)
17	Demographics: indicate time point (e.g. baseline)
18	Gender ratio
19	If CA dichotomous: Gender ratio per group (e.g. CA: 64% female; no-CA: 53% female)
20	SES
21	If CA dichotomous: SES per group (e.g. CA: low; no-CA: moderate)
22	Ethnicity
23	If CA dichotomous: Main Ethnicity per group (e.g. CA: 80% white, 20% mixed; no-CA: 90% white, 10% mixed)
24	CA assessment method
25	Name of CA assessment instrument (e.g. Childhood Trauma Questionnaire)
26	CA assessed at wave(s):
27	Amount of RFs
28	RF 1 assessment method
29	Name of RF 1
30	Name of RF 1 assessment instrument (e.g. Rosenberg Self-Esteem Scale)
31	RF 1 assessed at wave(s):
32	RF 2 assessment method
33	Name of RF 2
34	Name of RF 2 assessment instrument (e.g. Rosenberg Self-Esteem Scale)
35	RF 2 assessed at wave(s):
36	RF 3 assessment method
37	Name of RF 3
38	Name of RF 3 assessment instrument (e.g. Rosenberg Self-Esteem Scale)
39	RF 3 assessed at wave(s):
40	Amount of PP measures
41	PP assessment method 1
42	Name of PP 1
43	Name of PP assessment instrument 1 (e.g. Beck's Depression Inventory)
44	PP 1 assessed at wave(s):
45	PP assessment method 2
46	Name of PP 2
47	Name of PP assessment instrument 2 (e.g. Beck's Depression Inventory)

*Supplement II to be continued.*

<b>Item</b>	<b>Item content</b>
48	PP 2 assessed at wave(s):
49	PP assessment method 3
50	Name of PP 3
51	Name of PP assessment instrument 3 (e.g. Beck's Depression Inventory)
52	PP 3 assessed at wave(s):
53	Confounders measured and controlled for by: Design, statistics, or other (specify in description)
54	Specify confounders (e.g. SES, age, gender, etc.)
55	Specify PP:
56	Specify RF:
57	Choose: Mediation or Moderation
58	Analysis method e.g. regression, SEM, GEE, multilevel model + (MODERATION: (if necessary amount of RF main effects), amount of moderator(s), amount of RF moderator(s); MEDIATORS: amount of mediator(s), amount of RF mediator(s))
59	Analysis coefficient (e.g. beta)
60	Analysis statistic (e.g. t or z)
61	Significance (e.g. p value)
62	CI or SE
63	Effect Size
64	Note
65	Specify PP:
66	Specify RF:
67	Choose: Mediation or Moderation
68	Analysis method e.g. regression, SEM, GEE, multilevel model + (MODERATION: (if necessary amount of RF main effects), amount of moderator(s), amount of RF moderator(s); MEDIATORS: amount of mediator(s), amount of RF mediator(s))
69	Analysis coefficient (e.g. beta)
70	Analysis statistic (e.g. t or z)
71	Significance (e.g. p value)
72	CI or SE
73	Effect Size
74	Note
75	Specify PP:
76	Specify RF:
77	Choose: Mediation or Moderation
78	Analysis method e.g. regression, SEM, GEE, multilevel model + (MODERATION: (if necessary amount of RF main effects), amount of moderator(s), amount of RF moderator(s); MEDIATORS: amount of mediator(s), amount of RF mediator(s))
79	Analysis coefficient (e.g. beta)
80	Analysis statistic (e.g. t or z)
81	Significance (e.g. p value)
82	CI or SE
83	Effect Size
84	Note
85	Specify PP:
86	Specify RF:
87	Choose: Mediation or Moderation
88	Analysis method e.g. regression, SEM, GEE, multilevel model + (MODERATION: (if necessary amount of RF main effects), amount of moderator(s), amount of RF moderator(s); MEDIATORS: amount of mediator(s), amount of RF mediator(s))
89	Analysis coefficient (e.g. beta)
90	Analysis statistic (e.g. t or z)
91	Significance (e.g. p value)
92	CI or SE
93	Effect Size
94	Note
95	Specify PP:
96	Specify RF:
97	Choose: Mediation or Moderation
98	Analysis method e.g. regression, SEM, GEE, multilevel model + (MODERATION: (if necessary amount of RF main effects), amount of moderator(s), amount of RF moderator(s); MEDIATORS: amount of mediator(s), amount of RF mediator(s))
99	Analysis coefficient (e.g. beta)
100	Analysis statistic (e.g. t or z)
101	Significance (e.g. p value)
102	CI or SE
103	Effect Size
104	Note
105	Specify PP:
106	Specify RF:
107	Choose: Mediation or Moderation
108	Analysis method e.g. regression, SEM, GEE, multilevel model + (MODERATION: (if necessary amount of RF main effects), amount of moderator(s), amount of RF moderator(s); MEDIATORS: amount of mediator(s), amount of RF mediator(s))
109	Analysis coefficient (e.g. beta)
110	Analysis statistic (e.g. t or z)
111	Significance (e.g. p value)
112	CI or SE

*Supplement II to be continued.*

<b>Item</b>	<b>Item content</b>
113	Effect Size
114	Note
115	Analysis 1: Conclusion
116	Analysis 2: Conclusion
117	Analysis 3: Conclusion
118	Analysis 4: Conclusion
119	Analysis 5: Conclusion
120	Analysis 6: Conclusion
121	Name of RF 1
122	To which resilience factor category belongs the RF 1?
123	To which resilience factor domains belongs RF 1? NB: Indicate <b>ALL</b> domains that are applicable: e = emotional, b = behavioural, s = social, c = cognitive. E.g.: e, s.
124	Name of RF 2
125	To which resilience factor category belongs the RF 2?
126	To which resilience factor domains belongs RF 2? NB: Indicate <b>ALL</b> domains that are applicable: e = emotional, b = behavioural, s = social, c = cognitive. E.g.: e, s.
127	Name of RF 3
128	To which resilience factor category belongs the RF 3?
129	To which resilience factor domains belongs RF 3? NB: Indicate <b>ALL</b> domains that are applicable: e = emotional, b = behavioural, s = social, c = cognitive. E.g.: e, s.

### 3 Supplementary Table

Downs and Black's (7) scale is recommended for the assessment of randomized, as well as non-randomized studies (8). Given that we exclusively evaluated cohort studies we excluded 9 of 27 items, which are specific to randomized studies (i.e. adverse intervention effects, quality of the description of the used intervention, same recruitment for all intervention groups, representativeness of treatment facilities, intervention compliance, intervention blinding, randomization procedure, randomization concealment and power ,7). We duplicated one item, which assesses the accuracy of the outcome measure (i.e. psychopathology), twice, to also assess the accuracy of the CA and RF variables. Accordingly, the adapted quality rating scale contained 20 items.

*Quality assessment item content template: Adapted version of Downs and Black's (7) quality rating scale.*

Item	Item content
<i>NB: content of the original items from Downs and Black's (7) scale can be retrieved from (i.e. see appendix): <a href="http://jech.bmj.com/content/jech/52/6/377.full.pdf">http://jech.bmj.com/content/jech/52/6/377.full.pdf</a></i>	
<b>Article</b>	
1	Reference
2	ID
3	Note
<b>Description (1 = yes, 0 = no)</b>	
<i>NB: Questions which start with a * have another rating system</i>	
4	original item 1
5	original item 2
6	original item 3
7	original item 5* 2 = yes, 1 = partially, 0 = no
8	original item 6
9	original item 7
10	original item 9
11	original item 10
<b>Validity (1 = yes, 0 = no, 000 = unable to determine)</b>	
12	original item 11
13	original item 12
14	original item 15 (In our case: This is about whether those measuring psychopathology outcome were blind to the resilience factor(s).)
15	original item 16
16	original item 17 (In our case: Are the analyses adjusted for differences between participants regarding the length of follow-up?)
17	original item 18
18	adaption of the original item 20 (In our case: Was the childhood adversity measure used valid and reliable?)
19	adaption of the original item 20 (In our case: Were the resilience factor measures used valid and reliable?)
20	original item 20 (In our case: Were the psychopathology measures used valid and reliable?)
21	original item 21 (In our case: Were the participants in different CA groups recruited from the same population?)
22	original item 25
23	original item 26
<b>Total score</b>	
24	NB: This is an automatic field please do not enter numbers manually!

#### 4 Supplementary Table

##### *Analysis Method Quality Assessment: Item Content Template*

Item	Item content
<b>Article</b>	
1	Reference
2	ID
<b>Sample Size</b>	
3	Sample size
4	Appropriateness sample size: Moderation (NA = no moderation performed , 0 = inappropriate, 1 = appropriate)
5	Appropriateness sample size: Mediation (NA = no mediation performed , 0 = inappropriate, 1 = appropriate)
<b>RFs tested</b>	
6	How many RFs tested in total?
7	How many RFs significant in total?
8	How many RFs significant moderators?
9	How many RFs significant mediators?
10	Name of significant RFs
<b>Single Versus Multiple RFs</b>	
11	Multiple or single RF models?
12	Amount of moderators per model (0 if not appropriate; i.e. only RF moderators are counted)
13	Amount of mediators per model (0 if not appropriate; i.e. only RF mediators are counted)
<b>Quality Moderation Analysis</b>	
14	Moderation Rating (NA = no moderation performed, ? = not rateable, 1 = no/visual inspection, 2 = correlational post hoc probing, 3 = regression post hoc probing)
15	Note: Moderation
<b>Quality Mediation Analysis</b>	
16	Mediation Rating (NA = no mediation performed, ? = not rateable, 1 = no/direct effect reduction to non-significance, 2 = Sobel (or comparable formulas), 3 = bootstrap)
17	Note: Mediation
<b>Multiple Testing</b>	
18	Correction for multiple testing? (Not Necessary = NN, no = 0, yes =1)
19	Note: Correction for multiple testing?

## 5 Supplementary Description

In order to obtain a sample size guideline for interaction effects we conducted a power analysis. The resilience literature shows that whereas multifaceted clusters of CAs explain up to 30 percent of psychopathology indices (9), RF predictors have small to at the best moderate effect sizes (10). Moreover, research has indicated that interaction effects in social sciences are generally weak (11–13). For example, Champoux and Peters (12) reviewed 23 studies and found that moderation effects account for approximately 1 to 3 percent of the outcome variable (mean  $\Delta R^2 = .03$ ). Similarly, Aguinis and colleagues (11) found that the 261 reviewed moderation analyses had an average interaction effect size of .01 ( $f^2$ ). Based on those findings and on the fact that many of the reviewed studies include additional covariates or interaction effects, which requires larger sample sizes, we calculated the sample size for a moderation analysis with a moderate total effect ( $f^2 = .15$ ). The analysis was conducted in R with the package ‘pwr’ (14). We specified two main effects, one interaction effect ( $u = 3$ ), a moderate effect size of  $f^2 = .15$  (i.e. based on the above described findings and on Cohen’s effect size criteria ,15), an alpha level of .05, and a power threshold of .80. The analysis showed that a minimum of 77 participants is required ( $v = 72.71$ ;  $N = v + (u+1)$ ;  $N = 72.71 + 4$ ) to detect a moderate effect.

## 6 Supplementary Table

### *Studied Types of Childhood Adversity and Psychopathology.*

<b>CHILDHOOD ADVERSITY</b>			
<b>Childhood Maltreatment</b>	<b>Intra-Family Adversity</b>	<b>Community Adversity</b>	<b>Clustered Life Adversities</b>
emotional abuse(4,16–20)	marital distress/conflict(21)	ethnic-political conflict(22–24)	adverse life experiences(25,26)
sexual abuse(4,17,18,27,28)	parental problem drinking(5)	community violence(29)	
physical abuse(4,17,18,20,27,30)	aggressive parenting behaviour(31)		
emotional neglect(4,20)	parental violence(32)		
physical neglect(4,20)	parental mental health problems(33)		
	stressful family-level life events(34)		
	accumulated family adversity(35)		
<b>PSYCHOPATHOLOGY</b>			
<b>Disorder Types</b>		<b>Clustered Types of Psychopathology</b>	
anxiety symptoms(16,17,24)/ social anxiety symptoms(19)		psychological distress(25,28)	
depressive symptoms(17,19,24,27,31,33,35)		mental well-being(21,28)	
posttraumatic stress symptoms(18,22,23)		externalizing(4,5,21,23,29,30)	
substance (ab)use symptoms(4,32,34)		internalizing(4,21,23,29,30)	
conduct symptoms(20,24,26)			



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