November 2021

The Effect of Perceived Discrimination on Mental Health and Cognitive Functioning

David C. Steinberger
Washington University in St. Louis, davidsteinberger@wustl.edu

Deanna M. Barch
Washington University in St. Louis, dbarch@wustl.edu

Acknowledgements

Abstract

Research has revealed links between perceived discrimination (PD), mental health, and cognition. The present study sought to understand the moderational role of PD in the relation of mental health to cognition. Our sample consisted of 11,878 9–12-year-olds across 21 study sites. We conducted linear mixed effects models to analyze child internalizing/externalizing problem behaviors, cognitive ability, and PD. Higher PD related to worse internalizing and externalizing behaviors. Further, worse cognitive abilities generally related to worse internalizing and externalizing behaviors. Moreover, PD moderated the relation of internalizing/externalizing to cognition. Future longitudinal research should seek to establish the temporality of the relationships addressed in this cross-sectional analysis, in addition to investigating mechanisms underlying the role of PD in mental health and cognition.

Keywords: Discrimination; Internalizing; Externalizing; Cognition; Childhood

The Effect of Perceived Discrimination on Mental Health and Cognitive Functioning

Simply holding a minority status (e.g., due to race/ethnicity) carries a higher rate of adverse life circumstances; compared to White Americans, racial and ethnic minorities disproportionately face lower income and/or unemployment, living in less safe neighborhoods, worse health outcomes, and subtle and continual discrimination in the form of microaggressions (Cokley et al., 2011). However, an under-investigated phenomenon in this population is the adverse effects of the degree to which an individual perceives themself as experiencing social marginalization. In addition to such negative outcomes of marginalization, the *perception* of belonging to a marginalized group (e.g., perceived discrimination) may also play an important role in adverse health outcomes, specifically in mental health and cognitive function. For example, Pieterse et al. (2012) conducted a meta-analytic review of peer-reviewed studies which analyzed the relation of *perceived racism* to mental health in Black American adults. Pieterse et al. (2012) analyzed the Pearson correlation of the effect size of each study's relation between perceived racism and mental well-being. Of note, some of the compiled studies measured the *frequency* of perceived racism, whereas others measured the participants' reported distress *intensity* to perceived racism; others still measured both frequency and reported distress intensity. The meta-analytic results showed a robust relation of greater perceived racism to worse mental health outcome (e.g., anxiety and depression) in Black Americans. This meta-analysis offers some evidence (within a particular racial category) that the degree to which an individual perceives discrimination is linked with their mental health.

Cokley et al. (2011) similarly studied the relation between perceived discrimination in different ethnic minority/majority groups and emotional distress. Rather than focus on one particular population, Cokley et al. (2011) included 413 student participants in their study; 59%

ethnic minority and 40% ethnic majority; within the ethnic minority group were three subgroups comprised of African-, Asian-, and Latino-Americans, while the ethnic majority group was comprised of European-Americans. Cokley et al. (2011) found worse mental health and higher levels of perceived discrimination in the ethnic minority group, but no differences among the three ethnic subgroups. They also found a cumulative effect of perceived discrimination; ethnic minority participants who reported more than one marginalized identity (e.g., race/ethnicity, nationality, gender, sexual orientation, and religion) reported significantly more perceived discrimination than those who reported just one. Lastly, Cokley et al. (2011) analyzed perceived discrimination as a mediator in the relation between ethnic minority/majority status and emotional distress. They found a significant, though weak, effect for perceived discrimination as a mediator, and noted the somewhat stronger direct correlation of perceived discrimination and emotional distress. Overall, Cokley et al. (2011)'s results yield further support to the existence of a relation between marginalization and mental health.

Another meta-analysis found a strong link between perceived discrimination and mental well-being (e.g., depression, anxiety), but they notably found a stronger effect in children (< 13 years old) compared to adults (Schmitt et al., 2014). This age difference in the literature, which had predominantly examined the discrimination-mental health link in adults, has been followed up by additional meta-analytic evidence of this relationship in childhood (e.g., Benner et al., 2018). Given that researchers only recently found strong evidence of a link between perceived marginalization and mental health in youth, there is a continued need for investigation of the nature of this relationship in childhood.

It is not entirely clear why perceived discrimination plays the role that it does in mental health outcomes. One prominent theory, however, is the *social stress theory*, which purports that

social conditions serve as stressors for health issues (Aneshensel, 1992; Pearlin, 1989).

Specifically, Pearlin (1989) delineated that one's group identities (e.g., race/ethnicity or gender),

and the amount of resources that one has available due to their identities, form the basis of their

social status; a low status in society, then, becomes a source of *chronic strain*, in which the

individual is more susceptible to worse health outcomes following a stressful life event.

Particularly, in the context of our research, we believe that perceived discrimination is a chronic

social stressor that contributes to worse mental health and cognitive function. Given the literature

reviewed above, the present study sought to investigate the relation between psychopathology

and marginalization in children. In agreement with the previously described literature, we

hypothesized a relation between measures of mental illness and measures of perceived

discrimination); specifically, in a dimensional approach, we expected to find a higher rate of

internalizing and externalizing problem behaviors among children who reported higher levels of

perceived discrimination.

A second goal of this research study was to contribute to the literature on the link

between mental illness and cognitive function in childhood, by including perceived social

marginalization as a variable of consideration. The extant literature demonstrates that individuals

with psychopathological symptoms or diagnosis concomitantly experience worse cognitive

function. Research in internalizing disorders has found impairments in memory, attention and

executive functioning in depression (Marvel & Paradiso, 2004; Perini et al., 2019) and anxiety

disorders (Fujii et al., 2013; Yang et al., 2015). Furthermore, Vinberg et al. (2013) found that

cognitive impairment predicts onset of affective disorders in early childhood. Internalizing

behavior has also been found to be inversely related to fluid cognitive abilities, such as attention,

executive functioning, language ability, and learning ability (Thompson et al., 2019). In terms of

crystallized cognitive functioning (e.g., semantic memory), there is a link between reading

achievement and internalizing behavior in youth (Lambert & Nicoll, 1977).

There is also evidence linking externalizing behaviors to worse fluid cognition. For

instance, attentional problems, hyperactivity, aggression, and antisocial behavior are associated

with executive functioning deficits, even in preschool-aged children (Ogilvie et al., 2011;

Schoemaker et al., 2013). Lastly, externalizing behaviors are related to crystallized abilities; in

one study, low verbal ability was found to predict later criminal behavior (Bellair et al., 2016).

Another similar study found that verbal ability (e.g., vocabulary) in youth was inversely related

to measures of later delinquency, such as court convictions and law enforcement actions (i.e.,

juvenile offense filing by police), even after controlling for SES (Moffit et al., 1994).

Moreover, there is related research examining the relation of perceived social

marginalization to cognitive function. Barnes et al. (2012) studied the role of perceived

discrimination in cognitive ability. In a sample of 407 African American older adults without

dementia, participants answered a survey of questions assessing the frequency of perceived

discrimination. They found a significant negative relation, such that participants who reported

more frequent discrimination had worse global function, episodic memory and perceptual speed;

no significant relation was found for semantic memory, working memory, and visuospatial

ability. Barnes et al. (2012) did not share a theory as to why such cognitive abilities were

unaffected by perceived discrimination in their aging sample. However, they did propose that the

fact that the relation was selectively significant for episodic memory and perceptual speed lends

support to their belief that perceived discrimination serves as a social stressor for the onset of

Alzheimer's symptoms. Thus, their findings justify the possibility that perceived social

marginalization is related to impaired cognition. Additionally, these findings provide evidence

that the social stress theory described earlier may also support a prediction of worse cognitive

function in individuals who experience discrimination. Ultimately, we were unable to identify

relevant studies that examined perceived discrimination and cognitive ability in youth samples.

As such, the present study hopes to address this critical gap in the literature.

An associated research question is whether individuals experiencing mental health

symptoms who have marginalized identities experience a different cognitive functional outcome

than mentally ill individuals of non-marginalized identities. As we briefly introduced earlier,

chronic (and often daily) social stressors that marginalized individuals perceive, such as unfair

and discriminatory treatment, may have cumulative psychological effects that contribute to

worsened mental health and cognitive ability. To our knowledge, there has been no research

directly investigating the role of perceived social marginalization in the relation between

psychopathology and cognitive impairment. On account of the adult and youth literature on

mental illness and cognition, we hypothesized that poor cognitive functioning would be linked

with poor mental health. In addition, based on the research on discrimination and cognition, we

predicted an interaction such that perceived marginalization moderates the above-proposed

relation between cognitive function and mental well-being. In other words, experiencing social

marginalization may enhance the relation between cognition and mental health.

Methods

Participants

In the present study, we examined data from the multi-site Adolescent Brain and

Cognitive Development (ABCD) study. The ABCD study employed probability sampling to

follow nearly 11,878 children (and their parents) who were recruited through local public and

private elementary schools by 21 separate sites in the United States (Garavan et al., 2018). The

study participants ranged from 8.9 to 11.9 years old (M_{age} = 9.94, SD_{age} = .62), and distribution

was approximately equal between sexes (6,912 males, 5682 females, 4 intersex). The

racial/ethnic breakdown was 52% White, 15% Black, 20% Hispanic, 2% Asian, and 11% Other.

All child participants in this study completed written and verbal assent. More information on the

recruitment methodology can be obtained from Garavan and colleagues (2018).

Measures

Mental Health: We measured child mental health dimensionally, by examining parent-

informant report scores for the Child Behavior Checklist (CBCL) Internalizing and Externalizing

composite scales. The CBCL is a 113-item mental health questionnaire designed for children

ages 6 to 18. The Internalizing composite score encompasses questions pertaining to anxiety,

depression, social issues, and other mood-related problems; the Externalizing composite draws

from questions relating to interpersonal conflict and behavioral issues (Achenbach, 2009; Barch

et al., 2018). Parents completed the informant CBCL questionnaire at baseline (and each future

annual assessment) at the in-person assessment using REDCap; children were not present in the

study room when parents were answering the REDCap surveys. All questions were rated on a 3-

point Likert scale: 0 indicated "not true;" 1 indicated "sometimes true;" 2 indicated "very/often

true." Raw scores were converted to T-scores, which were then converted to Z-scores for

analysis.

Cognition: We utilized cognitive measures from the NIH Toolbox battery (Luciana et al.,

2018). The set includes five measures of Fluid cognition (e.g., executive functioning, cognitive

flexibility, episodic memory): Dimensional Change Card Sort Task (*Card Sorting*), Flanker

Inhibitory Control and Attention Test (*Flanker*), Picture Sequence Memory Test (*Picture

Memory*), List Sorting Working Memory Test (*Working Memory*), and Pattern Comparison

Processing Speed Test (*Processing Speed*). The Toolbox set included two measures of

Crystallized cognition (e.g., language, vocabulary, reading): Picture Vocabulary Test

(*Vocabulary*) and Oral Reading Recognition Test (*Reading*). Detailed explanations of the

construct, setup, and procedure for each cognitive task can be obtained from Luciana et al.

(2018). All Cognitive tasks were administered at baseline. Raw scores were converted to age-

corrected T-scores, which were then converted to Z-scores for analysis. Of note, Fluid and

Crystallized composite scores were examined as our primary analysis, followed by examination

of the seven individual subscales as a secondary analysis.

     Perceived Social Marginalization: We measured participants' experience of

marginalization by assessing their level of perceived discrimination. The questions measuring

Perceived Discrimination in this study were drawn from Phinney et al. (1998) due to their high

level of understandability amongst the population of interest (children ages 9-10). The Perceived

Discrimination questionnaire was administered at the year one follow-up. Participants answered

seven matrix questions in which they reported the frequency of their perceived discrimination

from 1 ("Never") to 5 ("Usually"); these questions involved distinct sources (e.g., teachers, other

adults) and types (e.g., unfair treatment by others, feeling unwanted in American society) of

discrimination. Matrix sum scores were converted to average total scores, which were then

converted to Z-scores for analysis.

Statistical Methods

     The analyses in the present study were executed in R Analytics. We first examined the

data for any outliers that might distort the results and did not find any. Of importance, however,

an overwhelming majority of participants ($n = 10{,}275$) in our sample had an average Perceived

Discrimination score below a 2, meaning they reported rarely experiencing discrimination. This

aspect of our sample will be discussed later in the context of methodological limitations. We performed linear mixed models using standardized predictors so that the beta weights could serve as a measure of effect size. All analyses used .05 as the significance level, and we corrected for multiple comparisons using the False Discovery Rate (FDR; Benjamini & Hochberg; Benjamini & Yekutieli, 2001). All results described below passed FDR correction, unless otherwise specified.

To test the first hypothesis, we conducted linear mixed effects models, with Perceived Discrimination as the predictor variable, and CBCL Internalizing and Externalizing as the outcome variables. To examine our hypothesis about the relation between cognitive function and mental health, we conducted linear mixed effects models, with the Fluid and Crystallized scores as the predictor variables, and CBCL Internalizing and Externalizing as the outcome variables (four total). Our third linear mixed effects model included the interaction between Perceived Discrimination and either Fluid or Crystallized scores (as well as the main effects); this analysis was a means of examining whether there was an interaction between Perceived Discrimination and Cognition in predicting either Internalizing or Externalizing symptoms in children. In cases where an interaction was significant, we conducted follow-up analyses using median splits to assess the relations between cognition and mental health in youth reporting high versus low Perceived Discrimination, as well as the relation between Perceived Discrimination and mental health among children with high versus low cognitive function. To illustrate, as will be shown below, we found an interaction of Fluid performance and Perceived Discrimination in predicting Externalizing; as a result, we performed a follow-up test, in which we looked at the regression relation between Fluid performance and Externalizing for high and low Perceived Discrimination and between Perceived Discrimination and Externalizing for high and low Fluid performance. In

our secondary analysis of cognitive function, we conducted the same linear mixed models as

described above for each of the seven individual subscale scores. All linear regression models

included *age*, *gender*, *socioeconomic status (SES)*, and *race/ethnicity* as standard covariates.

Furthermore, given the presence of (~800) twins in our sample and the confounding nature of a

multi-site setup, all models were nested within study-site and family to control for random

effects.

<div align="center">**Results**</div>

Relations of Perceived Discrimination to Internalizing and Externalizing Symptoms

When controlling for age, gender, SES, and race/ethnicity, there was a significant relation

of Perceived Discrimination to Internalizing ($t = 6.294$, $\beta = 0.062$, p < .001), such that higher

Perceived Discrimination scores were associated with higher Internalizing scores. A similar

relation was found between Perceived Discrimination and Externalizing scores ($t = 9.473$, $\beta =$

0.093, p < .001). As a secondary analysis, we created the same model but included race/ethnicity

as an interaction variable rather than a covariate. We found a significant interaction of Perceived

Discrimination and Race/Ethnicity in predicting Externalizing for the effects code of Black ($t = -$

2.863, $\beta = -0.071$, p = .004) and Hispanic ($t = -2.398$, $\beta = -0.061$, p = .017) youth. We did not

see a significant interaction for Internalizing. Follow-up analyses split by the Race/Ethnicity

factor revealed that the Asian participants had the strongest relation of Perceived Discrimination

to Externalizing symptoms ($t = 3.125$, $\beta = 0.207$, p = .002). When Asian youth were removed

from the analysis, the main effect of Perceived Discrimination on Externalizing remained

significant ($t = 2.658$, $\beta = 0.24$, p = .008); however, there was no longer a significant interaction

between Race/Ethnicity and Perceived Discrimination in predicting Externalizing symptoms ($t =$

-1.685, $\beta = -0.153$, p =.092)

Relations of Fluid and Crystallized scores to Internalizing and Externalizing symptoms

As seen in Table 1, we found a significant relation of Fluid performance to Internalizing and Externalizing symptoms, such that lower Fluid composite scores related to higher Internalizing (Figure 1) and Externalizing (Figure 2) symptoms among youth. We also found significant relations of Crystallized performance to both Internalizing (Figure 3) and Externalizing (Figure 4) symptoms. Similar to Fluid performance, lower Crystallized scores were associated with higher Externalizing symptoms. However, in contrast to previous analyses, higher Crystallized scores were associated with more severe Internalizing symptoms. The results of our secondary analysis for the second linear mixed effects model are depicted in Table 1.

Interactions between Cognition and Perceived Discrimination in relation to Internalizing and Externalizing symptoms

As shown in Table 2, we observed a significant interaction of Fluid ability and Perceived Discrimination in predicting Externalizing symptoms (Figure 5) but not Internalizing symptoms. Furthermore, we found significant interactions between Crystallized ability and Perceived Discrimination in predicting both Internalizing (Figure 6) and Externalizing (Figure 7). The results of our secondary analysis for the third linear mixed model are depicted in Table 2.

To follow up on these interactions, we utilized median splits to separately compare high and low groups of Fluid/Crystallized ability and high and low groups of Perceived Discrimination. As shown in Tables 3 and 4, the source of the interaction was not consistent with the hypotheses that the combination of higher Perceived Discrimination and worse Cognition would be associated with greater psychopathology. Instead, for most of the interactions, the relation between Perceived Discrimination and either Internalizing or Externalizing symptoms was stronger among children who had higher cognitive functioning (see Table 3 for detailed

results). Likewise, for some of the interactions, the relation between cognition and either

Internalization or Externalization was stronger among children who reported lower Perceived

Discrimination; this finding, however, was less conclusive than that of the cognition median split

results (see Table 4 for detailed results).

Discussion

In the present study, we set out to better understand the relation between perceived social

marginalization, cognitive functioning, and mental health. In support of our first hypothesis, we

found a positive relation of Perceived Discrimination to mental health symptoms. Namely,

higher Perceived Discrimination was associated with more severe Internalizing and Externalizing

behaviors. Our second hypothesis was also supported, as we generally found an inverse relation

of cognitive ability to mental health symptoms. That is, lower Fluid performance was linked with

more severe Internalizing and Externalizing symptoms, and lower Crystallized performance was

linked with worse Externalizing symptoms. The exception to this pattern was that lower

Crystallized ability associated with lower Internalizing problem scores. Our third hypothesis was

not borne out by the data; though the predicted interactions were significant, upon parsing out the

relations with median splits, we found that the positive relation of Perceived Discrimination to

mental health behaviors was stronger amongst youth with *higher* cognitive ability. Also

inconsistent with our third hypothesis was the finding that the inverse relation of cognitive ability

to mental health was stronger amongst youth with *lower* Perceived Discrimination. The notable

exception that was consistent with our third hypothesis was the relation for Crystallized

cognition; however, secondary analyses examining the Crystallized subscales did not yield

significant results, thus making it difficult to determine the relevance of the exceptional result

from the Crystallized Composite. The final inconsistency with our third prediction was that

Perceived Discrimination did not significantly interact with Fluid cognition in predicting

Internalizing. Each of these findings will be discussed in more detail below.

The first finding—that Perceived Discrimination was positively related to Internalizing

and Externalizing scores—is consistent with prior research (Cokley et al., 2011; Pieterse et al.,

2012). While the relation of Perceived Discrimination to Externalizing behaviors was significant

for all racial/ethnic groups, we did find a significant interaction with Race, with the largest

association amongst Asian participants. When we removed the Asian participants from the

analysis, there was no longer a significant interaction with Race. Interestingly, this finding—that

the Asian group drove the interaction of Perceived Discrimination and Race/Ethnicity in

predicting Externalizing—may be consistent with a finding of Cokley et al. (2011). That is,

Cokley et al. (2011) found the numerically largest correlation between perceived discrimination

and mental distress among Asian-Americans. Cokley and colleagues did not test for differences

between correlations for their ethnic groups; therefore, their results provide some preliminary

support for a distinctly stronger relationship between Perceived Discrimination and mental health

in Asian Americans. As a result, we urge future social stressor researchers to investigate the

differences among racial/ethnic groups in this relationship; it is of special interest to public and

mental health professionals to determine if a particular group is especially susceptible to worse

mental health issues due to Perceived Discrimination.

The second finding—that cognitive ability was inversely related to mental health

issues—serves as further support to a large body of research investigating the relation of

cognition to mental health (Fujii et al., 2013; Marvel & Paradiso, 2004; Ogilvie et al., 2011;

Perini et al., 2019; Schoemaker et al., 2013; Vinberg et al., 2013; Yang et al., 2015). However, as

mentioned above, Crystallized cognition showed an opposite relation to Internalizing scores,

such that higher cognitive ability was associated with more severe parent-reported internalizing

symptoms. Additionally, the follow-up tests were somewhat consistent with the composite

results: one of the Crystallized subscales showed the same positive relation to Internalizing

scores, whereas the other subscale's relation was insignificant. Overall, it is unusual and

unexpected to find that children with higher Crystallized cognition (e.g., larger vocabulary) more

often display internalizing behaviors than their peers with lower Crystallized cognition. One way

we theorize to account for this is the notion that children with higher verbal ability thus have a

greater capacity for verbalizing their internalizing issues to their parents or caregivers; in this

case, parents of children with a higher Crystallized ability may detect internalizing behaviors

more readily. Given the limited prior research on Crystallized abilities and internalizing

behaviors, it is possible that further investigation is required in order to uncover the true

relationship; however, in spite of the different research approaches, our finding does not seem to

support the previous finding that externalizing behavior does not significantly predict worse

reading ability in a similar population age (Lambert & Nicoll, 1977).

The third finding—that Perceived Discrimination interacts with cognition in predicting

mental health—has some interesting implications. We had predicted an interaction, given the

literature that separately implicates a role of perceived discrimination in mental health (Cokley et

al., 2011; Pieterse et al., 2012) and cognition (Barnes et al., 2012). However, follow-up median

split tests demonstrated the opposite direction we expected; in contrast to our predictions,

participants with *higher* cognitive functioning had a stronger association of perceived

discrimination to mental health, and participants who experienced less perceived discrimination

had a stronger association of cognition to mental health. We cannot provide an obvious

explanation to explain these counterintuitive findings. Nonetheless, we suspect that children with

higher cognitive performance may have a better understanding of the complex workings of systemic racism, as well as its psychological, social, and economic effects. Perhaps, then, such heightened societal awareness augments the negative impact of perceived discrimination on mental health and cognitive function.

Limitations

Despite the important strengths of the present study, such as its large sample size and its multi-site data collection, we also note the key weaknesses in our approach. Firstly, the data available to us currently was cross-sectional, as the ABCD study only recently launched. Consequently, it is impossible to assess causality of many of the relations we examined. In the coming years, however, the comprehensive ABCD study will continue to garner longitudinal data of the youth participants' cognitive function and mental well-being. Secondly, while we were able to find many significant associations due to the large sample size, the results in our analyses yielded small effect sizes. It is possible, though, that a longitudinal ABCD dataset with a longer time horizon would yield effect sizes of a larger magnitude; given our proposed psychosocial theory of perceived discrimination, the ability of a chronic stressor such as perceived discrimination to predict cognitive and mental health may strengthen over time. A third limitation of our study was the relatively low reporting of a primary variable of interest, perceived discrimination. This may have limited our examination of the cognitive and mental health effects of such an adverse experience given the small portion of participants who reported any perceived discrimination. Another related limitation was that measures of child mental health were informant reports completed by the participants' parents. Parents are not perfect informants on their child's mental well-being, particularly if the child is experiencing internalizing issues. Thus, the true strength of the relationship of mental health with perceived

discrimination and cognitive function may have been stronger (especially for Internalizing) or weaker (especially for Externalizing), had we used child self-report. Nevertheless, the ABCD study will include child self-reports of internalizing and externalizing behaviors in future follow-up assessments, which will allow for a separate analysis of the convergent validity of parent informant-reports (i.e., concordance). Due to these limitations of reported perceived discrimination and mental health, the generalizability of our findings may be reduced.

Future Directions

Future investigations of the ABCD dataset should re-examine the ability of perceived discrimination measured at the one-year follow-up to predict later mental health, as well as its interaction with cognition in predicting later mental health. In doing so, causality can be addressed in the relation of perceived discrimination to cognition and mental health. Secondly, future studies could benefit from sampling a higher proportion of children who report perceived discrimination, in order to better assess the health effects of perceived discrimination on that particular population. Finally, our follow-up interaction findings warrant continued attention in future research. Subsequent investigations into the relation of perceived discrimination to cognition and mental health should look into the differences between children of higher and lower perceived discrimination, as well as those higher and lower in cognitive ability. Such research should design their approach to better understand why the inverse association of cognition to mental health issues might be stronger in children with lower rates of perceived discrimination; likewise, such research should seek to understand why the positive association of perceived discrimination to mental health issues is stronger in children with higher cognitive functioning.

Conclusion

The present study offers several key implications for the field of clinical psychology, specifically, the study of cognitive dysfunction in mental illness. First, it provides further replication of the phenomenon that psychopathology and cognitive dysfunction are linked. Second, it provides mental healthcare workers with the important information that people of marginalized and/or oppressed identities may be more likely to experience mental health issues with greater levels of perceived discrimination, potentially more so among individuals with better cognitive function who may be particularly aware of the forces of systemic racism. Therefore, such individuals require care that accounts for the unique effect of their marginalized identities. Ultimately, the present investigation informs research and clinical practice that early *identity-informed* interventions are imperative; our findings indicate to parents, teachers, and clinicians the importance of early mental health screening for children of marginalized identities who experienced unfair, discriminatory treatment.

References

Achenbach, T. M. (2009). *The Achenbach system of empirically based assessment (ASEBA): Development, findings, theory, and applications*. University of Vermont, Research Center for Children, Youth, & Families.

Aneshensel, C. S. (1992). Social stress: Theory and research. *Annual review of sociology*, *18*(1), 15-38.

Assari, S. (2018). Does school racial composition explain why high income black youth perceive more discrimination? A gender analysis. *Brain sciences*, *8*(8), 140.

Assari, S., Gibbons, F. X., & Simons, R. L. (2018). Perceived discrimination among black youth: an 18-year longitudinal study. *Behavioral Sciences*, *8*(5), 44.

Barch, D. M., Albaugh, M. D., Avenevoli, S., Chang, L., Clark, D. B., Glantz, M. D., ... & Alia-Klein, N. (2018). Demographic, physical and mental health assessments in the adolescent brain and cognitive development study: Rationale and description. *Developmental cognitive neuroscience*, *32*, 55-66.

Barnes, L. L., Lewis, T. T., Begeny, C. T., Yu, L., Bennett, D. A., & Wilson, R. S. (2012). Perceived discrimination and cognition in older African Americans. *Journal of the International Neuropsychological Society: JINS*, *18*(5), 856.

Bellair, PE, McNulty, TL, & Piquero, AR (2016). Verbal ability and persistent offending: A race-specific test of Moffitt's theory. *Justice Quarterly*, *33* (3), 455-480.

Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal statistical society: series B (Methodological)*, *57*(1), 289-300.

Benjamini, Y., & Yekutieli, D. (2001). The control of the false discovery rate in multiple testing

under dependency. *Annals of statistics*, 1165-1188.

Benner, A. D., Wang, Y., Shen, Y., Boyle, A. E., Polk, R., & Cheng, Y. P. (2018). Racial/ethnic

discrimination and well-being during adolescence: A meta-analytic review. *American*

Psychologist, *73*(7), 855.

Cokley, K., Hall-Clark, B., & Hicks, D. (2011). Ethnic minority-majority status and mental

health: The mediating role of perceived discrimination. *Journal of Mental Health*

Counseling, *33*(3), 243-263.

Fujii, Y., Kitagawa, N., Shimizu, Y., Mitsui, N., Toyomaki, A., Hashimoto, N., ... & Kusumi, I.

(2013). Severity of generalized social anxiety disorder correlates with low executive

functioning. *Neuroscience letters*, *543*, 42-46.

Garavan, H., Bartsch, H., Conway, K., Decastro, A., Goldstein, R. Z., Heeringa, S., ... & Zahs,

D. (2018). Recruiting the ABCD sample: Design considerations and

procedures. *Developmental cognitive neuroscience*, *32*, 16-22.

Lambert, N. M., & Nicoll, R. C. (1977). Conceptual model for nonintellectual behavior and its

relationship to early reading achievement. *Journal of Educational Psychology*, *69*(5),

481.

Luciana, M., Bjork, J. M., Nagel, B. J., Barch, D. M., Gonzalez, R., Nixon, S. J., & Banich, M.

T. (2018). Adolescent neurocognitive development and impacts of substance use:

Overview of the adolescent brain cognitive development (ABCD) baseline

neurocognition battery. *Developmental cognitive neuroscience*, *32*, 67-79.

Marvel, C. L., & Paradiso, S. (2004). Cognitive and neurological impairment in mood disorders.

Psychiatric Clinics, *27*(1), 19-36.

Moffit, T. E., & Harrington, H. L. (1994). Delinquency across development: the natural history

of antisocial behaviour in the Dunedin multidisciplinary health and development study. In

The Dunedin study: from birth to adulthood. Oxford University Press, Oxford.

Ogilvie, J. M., Stewart, A. L., Chan, R. C., & Shum, D. H. (2011). Neuropsychological measures

of executive function and antisocial behavior: A meta-analysis. *Criminology*, *49*(4),

1063-1107.

Pearlin, L. I. (1989). The sociological study of stress. *Journal of health and social behavior*, 241-

256.

Perini, G., Ramusino, M. C., Sinforiani, E., Bernini, S., Petrachi, R., & Costa, A. (2019).

Cognitive impairment in depression: recent advances and novel treatments.

Neuropsychiatric disease and treatment, *15*, 1249.

Phinney, J. S., Madden, T., & Santos, L. J. (1998). Psychological variables as predictors of

perceived ethnic discrimination among minority and immigrant adolescents 1. *Journal of

Applied Social Psychology*, *28*(11), 937-953.

Pieterse, A. L., Todd, N. R., Neville, H. A., & Carter, R. T. (2012). Perceived racism and mental

health among Black American adults: A meta-analytic review. *Journal of Counseling

Psychology*, *59*(1), 1.

Schmitt, M. T., Branscombe, N. R., Postmes, T., & Garcia, A. (2014). The consequences of

perceived discrimination for psychological well-being: a meta-analytic

review. *Psychological bulletin*, *140*(4), 921.

Schoemaker, K., Mulder, H., Deković, M., & Matthys, W. (2013). Executive functions in

preschool children with externalizing behavior problems: A meta-analysis. *Journal of

abnormal child psychology*, *41*(3), 457-471.

Thompson, W. K., Barch, D. M., Bjork, J. M., Gonzalez, R., Nagel, B. J., Nixon, S. J., & Luciana, M. (2019). The structure of cognition in 9 and 10 year-old children and associations with problem behaviors: Findings from the ABCD study's baseline neurocognitive battery. *Developmental cognitive neuroscience*, *36*, 100606.

Vinberg, M., Miskowiak, K. W., & Kessing, L. V. (2013). Impairment of executive function and attention predicts onset of affective disorder in healthy high-risk twins. The Journal of clinical psychiatry, 74(8), e747-53.

von Stumm, S., & Plomin, R. (2015). Socioeconomic status and the growth of intelligence from infancy through adolescence. *Intelligence*, *48*, 30-36.

Yang, Y., Zhang, X., Zhu, Y., Dai, Y., Liu, T., & Wang, Y. (2015). Cognitive impairment in generalized anxiety disorder revealed by event-related potential N270. *Neuropsychiatric disease and treatment*, *11*, 1405.

Table 1: Relations of Cognition to Internalizing and Externalizing symptoms

Predictor Variable	Internalizing		
Fluid Ability	*Coefficient*	*t-value*	*Sig.*
Fluid Composite	-0.038	-3.824	< .001
Flanker	-0.024	-2.584	.01
Card Sorting	-0.024	-2.542	.011
Picture Memory	-0.025	-2.655	.008
Working Memory	-0.016	-1.609	.108
Processing Speed	-0.015	-1.587	.112
Crystallized Ability	*Coefficient*	*t-value*	*Sig.*
Crystallized Composite	0.033	3.109	.002
Vocabulary	0.038	3.582	< .001
Reading	0.017	1.756	.079
Predictor Variable	Externalizing		
Fluid Ability	*Coefficient*	*t-value*	*Sig.*
Fluid Composite	-0.074	-7.362	< .001
Flanker	-0.034	-3.644	< .001
Card Sorting	-0.037	-3.916	< .001
Picture Memory	-0.069	-7.239	< .001
Working Memory	-0.067	-6.883	< .001
Processing Speed	-0.02	-2.076	.038
Crystallized Ability	*Coefficient*	*t-value*	*Sig.*
Crystallized Composite	-0.049	-4.646	< .001
Vocabulary	-0.035	-3.318	< .001
Reading	-0.048	-4.803	< .001

Table 2: Relations between Cognition subscales and Perceived Discrimination to Internalizing and Externalizing symptoms

Predictor Variable	Internalizing		
*Fluid Ability * Perceived Discrimination*	*Coefficient*	*t-value*	*Sig.*
Fluid Composite	0.01	0.979	.328
Flanker	0.019	2.078	.038*
Card Sorting	0.009	0.871	.384
Picture Memory	0.007	0.652	.514
Working Memory[a]	NA	NA	NA
Processing Speed[a]	NA	NA	NA
Crystallized Ability Perceived Discrimination*	*Coefficient*	*t-value*	*Sig.*
Crystallized Composite	0.022	2.101	.036
Vocabulary	0.022	2.216	.027
Reading[a]	NA	NA	NA
Predictor Variable	**Externalizing**		
*Fluid Ability * Perceived Discrimination*	*Coefficient*	*t-value*	*Sig.*
Fluid Composite	0.038	3.915	< .001
Flanker	0.029	3.251	.001
Card Sorting	0.026	2.570	.01
Picture Memory	0.032	3.224	.001
Working Memory	0.034	3.652	< .001
Processing Speed	0.001	0.105	.916
*Crystallized Ability * Perceived Discrimination*	*Coefficient*	*t-value*	*Sig.*

Crystallized Composite	0.035	3.339	.001
Vocabulary	0.034	3.494	< .001
Reading	0.025	2.306	.021

[a] Interaction analysis was not performed due to corresponding insignificant prediction in second linear mixed effects model

* Model did not survive FDR correction

Table 3: High versus Low Cognition for Perceived Discrimination predicts Internalizing and

Externalizing symptoms

Median Split Variable		Internalizing		
Fluid Ability		*Coefficient*	*t-value*	*Sig.*
Fluid Composite[a]	Low	NA	NA	NA
	High	NA	NA	NA
Flanker	Low	0.056	4.226	< .001
	High	0.078	5.056	< .001
Card Sorting[a]	Low	NA	NA	NA
	High	NA	NA	NA
Picture Memory[a]	Low	NA	NA	NA
	High	NA	NA	NA
Working Memory[a]	Low	NA	NA	NA
	High	NA	NA	NA
Processing Speed[a]	Low	NA	NA	NA
	High	NA	NA	NA
Crystallized Ability		*Coefficient*	*t-value*	*Sig.*
Crystallized Composite	Low	0.052	4.279	< .001
	High	0.096	5.185	< .001
Vocabulary	Low	0.062	5.064	.03
	High	0.076	4.258	< .001
Reading[a]	Low	NA	NA	NA
	High	NA	NA	NA

Median Split Variable		Externalizing		
Fluid Ability		*Coefficient*	*t-value*	*Sig.*
Fluid Composite	Low	0.074	5.632	< .001
	High	0.127	8.185	< .001
Flanker	Low	0.078	5.849	< .001
	High	0.115	7.556	< .001
Card Sorting	Low	0.071	5.375	< .001
	High	0.125	8.08	< .001
Picture Memory	Low	0.07	5.24	< .001
	High	0.128	8.448	< .001
Working Memory	Low	0.072	5.366	< .001
	High	0.12	7.689	< .001
Processing Speed[a]	Low	NA	NA	NA
	High	NA	NA	NA
Crystallized Ability		*Coefficient*	*t-value*	*Sig.*
Crystallized Composite	Low	0.071	5.791	< .001
	High	0.139	7.751	< .001
Vocabulary	Low	0.075	6.027	< .001
	High	0.138	7.895	< .001
Reading	Low	0.074	6.043	< .001
	High	0.135	7.68	< .001

[a] Follow-up analysis was not performed due to corresponding insignificant/unperformed interaction

Table 4: High versus Low Perceived Discrimination for Cognition predicts Internalizing and

Externalizing symptoms

Median Split Variable: *Perceived Discrimination*	**Predictor Variable**	**Internalizing**		
	Fluid Ability	*Coefficient*	*t-value*	*Sig.*
Low	Fluid Composite[a]	NA	NA	NA
High		NA	NA	NA
Low	Flanker	-0.033	-2.487	.013
High		-0.016	-1.203	.229
Low	Card Sorting[a]	NA	NA	NA
High		NA	NA	NA
Low	Picture Memory[a]	NA	NA	NA
High		NA	NA	NA
Low	Working Memory[a]	NA	NA	NA
High		NA	NA	NA
Low	Processing Speed[a]	NA	NA	NA
High		NA	NA	NA
Perceived Discrimination	*Crystallized Ability*	*Coefficient*	*t-value*	*Sig.*
Low	Crystallized Composite	0.051	3.62	< .001
High		0.025	1.608	.108
Low	Vocabulary	0.045	3.204	.001
High		0.042	2.691	.007
Low	Reading[a]	NA	NA	NA
High		NA	NA	NA

Perceived Discrimination	Fluid Ability	Coefficient	t-value	Sig.
Low	Fluid Composite	-0.084	-6.197	< .001
High		-0.062	-4.166	< .001
Low	Flanker	-0.042	-3.222	.001
High		-0.028	-2.084	.037
Low	Card Sorting	-0.036	-2.894	.004
High		-0.037	-2.579	.01
Low	Picture Memory	-0.072	-5.678	< .001
High		-0.063	-4.384	< .001
Low	Working Memory	-0.071	-5.263	< .001
High		-0.06	-4.253	< .001
Low	Processing Speed[a]	NA	NA	NA
High		NA	NA	NA
Perceived Discrimination	Crystallized Ability	Coefficient	t-value	Sig.
Low	Crystallized Composite	-0.028	-2.015	.044
High		-0.063	-3.941	< .001
Low	Vocabulary	-0.031	-2.222	.026*
High		-0.028	-1.806	.071
Low	Reading	-0.021	-1.605	.109
High		-0.072	-4.805	< .001

[a] Follow-up analysis was not performed due to corresponding insignificant/unperformed interaction

* Model did not survive FDR correction

Figure 1: Significant negative relation of Fluid scores to Internalizing behaviors

Figure 2: Significant negative relation of Fluid scores to Externalizing behaviors

Figure 3: Significant positive relation of Crystallized scores to Internalizing behaviors

Figure 4: Significant negative relation of Crystallized scores to Externalizing behaviors

Figure 5: Significant interaction of Perceived Discrimination and Fluid Ability in predicting Externalizing behaviors

Figure 6: Significant interaction of Perceived Discrimination and Crystallized Ability in predicting Internalizing behaviors

Figure 7: Significant interaction of Perceived Discrimination and Crystallized Ability in predicting Externalizing behaviors