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Investigating concurrent and longitudinal transdiagnostic correlates of executive functioning in adolescents: A multi-informant multi-method approach

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ABSTRACT

Introduction: Adolescence is a developmental period where executive functions differentiate and mature. Prior research suggests that transdiagnostic processes – i.e. mechanisms that serve as risk or maintaining factors of psychopathology – negatively impact adolescent executive functioning both concurrently and over time. Understanding how these processes and executive functioning are assessed and interrelated can help neuropsychologists make more accurate diagnostic and treatment recommendations. This study aimed to identify concurrent and longitudinal correlates between adolescent executive functioning and transdiagnostic processes, including emotion regulation, affect, and Hierarchical Taxonomy of Psychopathology (HiTOP) spectra (i.e. higher-order symptom domains like internalizing, externalizing, and somatic symptoms), using a multi-informant, multi-method design.

Methods: We assessed 100 adolescents using behavioral, self- and parent-reported measures of these transdiagnostic processes and executive functioning across two time points. Effect sizes of unadjusted, bivariate correlations were examined.

Results: Performance-based executive functioning did not correlate with self- or informant-reported executive functioning. Cross-informant agreement, however, was often evident for executive function tasks at small effects. While patterns of correlations generally differed across the assessment approaches and informants, negative affect and externalizing symptoms consistently showed small associations with concurrent executive functioning.

Conclusions: Affective demands (e.g. emotion regulation difficulties, internalizing symptoms, negative affect) were negatively associated with concurrent executive functioning, suggesting that such burdens may compromise adolescents' performance on executive tasks. Clinicians are encouraged to evaluate internalizing symptoms contemporaneously with executive function testing, and to attend carefully to adolescent – informant relationships and disclosure dynamics. Implications for multi-method, multi-informant approaches to adolescent assessment are discussed.

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Executive functioning; transdiagnostic processes; emotion regulation; Affect; Hierarchical Taxonomy of Psychopathology (HiTop)

Executive functions are higher-order cognitive abilities that govern goal-oriented behavior (Diamond, 2013). These functions are particularly salient during adolescence when they begin differentiating (Laureys et al., 2022) and forming strong associations with vocational, academic, and mental health outcomes (Chaku et al., 2022; Cortés Pascual et al., 2019; Diamond, 2013; Romer & Pizzagalli, 2021). Alongside executive functioning, mental health symptom severity and maladaptive emotion regulation strategies increase during adolescence (Costello et al., 2011; Maughan et al., 2013), which is concerning given that these key processes negatively impact executive function development and performance (Halse et al., 2024; Silvers, 2022; Zimmermann & Iwanski, 2014). Indeed, mental health, affect, and emotion regulation can likely serve as transdiagnostic processes in assessing executive functioning during adolescence. However, little is known about how these processes associate with executive functioning across adolescence and across different measurement perspectives. As such, this study explores correlational patterns across assessment approaches of executive functioning as well as patterns across transdiagnostic processes and executive functioning in adolescence.

Executive functioning

Executive functions are divided into "hot" and "cool" cognitive processes (Zelazo & Carlson, 2012). Cool executive functions refer to higher-order tasks void

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of valence or motivations (e.g., Digit Span subtest of the WISC) and predict academic success. Specific cool functions like shifting, inhibition, working memory, and planning begin differentiating starting in early adolescence (i.e., 10 years old; Laureys et al., 2022; Miyake et al., 2000). While shifting plateaus during mid-adolescence, inhibition and working memory continue improving into emerging adulthood (Best & Miller, 2010; Luna et al., 2004). Hot executive functions, in contrast, include an affective or motivational component (e.g., delay-discounting tasks; Goldstein & Naglieri, 2014) and predict emotional adjustment (Poon, 2018; Zelazo & Carlson, 2012). Hot executive functioning develops in a curvilinear pattern that decreases during mid-adolescence (i.e., 14 to 16 years old) and increases into emerging adulthood (Poon, 2018). This decrease in hot executive functioning corresponds with greater sensitivity to social contexts in adolescents compared to children and adults (Cohen et al., 2016; Crone et al., 2017; Perino et al., 2016).

Despite the salience of executive functioning during adolescence, assessment of executive functions faces some notable limitations. Performance-based and self-reported measures of executive functioning negligibly correlate with each other across the lifespan, suggesting that these methodological approaches may tap into different constructs (Toplak et al., 2013). Some scholars argue that self-report measures capture emotional distress and personality rather than cognitive functioning (Buchanan, 2016; Shwartz et al., 2020). Others, however, posit that self-report measures better assess goal-oriented behavior (Barkley & Murphy, 2010; Toplak et al., 2013). Part of this discrepancy emerges because lab-based executive functioning tasks are designed to assess within-person differences instead of between-person variance, as is common with clinical measures (Dang et al., 2020). For example, Miyake et al. (2000) unity-and-diversity model has small inter-task correlations, suggesting that the majority of variance assessed in those tasks are attributable to error rather than true executive function ability. Recent work has attempted to improve performance-based tasks by increasing "ecological validity," but these tasks (e.g., pill-sorting tasks) have not yielded improvements over traditional assessments of executive functioning (Ziemnik & Suchy, 2019; see Suchy et al., 2024 for concerns regarding the term "ecological validity"). Therefore, further research on executive functioning assessment is needed during adolescence.

Transdiagnostic processes

Given the complex fluctuations in adolescent cognitive, biological, and social development, adolescents are vulnerable to mental health issues. Most adults report an onset for their diagnoses during their adolescence (Kim-Cohen et al., 2003; Merikangas et al., 2010). Symptom severity during adolescence can serve as a risk factor for more severe and recurrent internalizing psychopathology in adulthood (Johnson et al., 2018; Zisook et al., 2007). This timing underscores the need for integrative conceptual frameworks which bridge developmental processes with psychological functioning (Ingram & Cole, 2025). Thus, transdiagnostic processes can serve as mechanisms which act as risk or maintaining factors across different psychological disorders and psychological states (Wade et al., 2025). Transdiagnostic processes are examined in isolation (e.g., avoidance) or within alternative classification systems that range from "soft" approaches working within current taxonomy (e.g., DSM-5 personality disorder clusters) to "hard" approaches that offer alternative conceptualizations to mental health (e.g., Research Domain Criteria; Dalgleish et al., 2020).

The Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov et al., 2017) is a popular data-driven framework for understanding co-occurring symptoms of psychopathology. Unlike traditional classifications of psychopathology, like the Diagnostic and Statistical Manual of Mental Disorders, HiTOP classifies symptoms as dimensional and hierarchical. Developed through factor analytic techniques, HiTOP describes broad patterns of mental health symptoms (i.e., spectra), organized by the type of psychopathology, including internalizing, externalizing, thought disorder, and somatoform domains (see Kotov et al., 2017; c.f.; Haeffel et al., 2022). HiTOP offers an alternative to traditional diagnostic taxonomy while also aligning to current psychiatric diagnoses (Forbes et al., 2023, 2024; Krueger, 1999) and historical symptom pattern precedent (internalizing/externalizing disorders; e.g., Achenbach, 1966). As such, HiTOP balances "soft" and "hard" transdiagnostic approaches. Research has examined HiTOP spectra and executive functioning, finding that impaired executive functioning predicts HiTOP spectra across childhood and into adolescence (Halse et al., 2024; Romer & Pizzagalli, 2021). Therefore, HiTOP serves as a useful framework to examine executive functioning and broad psychopathology.

Affect refers to the underlying subjective experience of emotion. Affect ranges in intensity (i.e., low versus high affect) and subsumes fundamental emotional states

(see Watson & Tellegen, 1985). During adolescence, negative affect moderately correlates with self-reported issues with inhibition and shifting (Dickson & Ciesla, 2018). While research examining affect and executive functioning in adolescents is limited, research in emerging adults suggests that aspects of negative affect, such as worry and anxiety, have small associations with executive functioning as well as errors with perseveration (Gustavson et al., 2020; Shields et al., 2016). In contrast, positive affect does not significantly associate with executive functioning (e.g., Lautenbach, 2024). These findings suggest that negative, but not positive, affect may impact executive functioning, warranting further investigation.

Research has also examined emotion regulation as a transdiagnostic process in mental health (Aldao et al., 2016; Brenning et al., 2022; Compas et al., 2017). Emotion regulation refers to the intentional or autonomic modification of emotional states to achieve a goal (Gross, 2015; Thompson, 1991). Emotion regulation strategies are classified based on their adaptiveness (Aldao et al., 2010), temporal implementation and valuation (Gross, 1998, 2015), and internal versus external use (i.e., cognitive versus behavioral strategies; Cole et al., 2019; Naragon-Gainey et al., 2017). Emotion regulation shifts from external to internal use as children develop into adolescence. A curvilinear pattern emerges where adaptive regulation strategies diminish and maladaptive emotion regulation strategies peak during mid-adolescence – mirroring the development of hot executive functions in adolescence (Cracco et al., 2017, Poon, 2018; Zimmermann & Iwanski, 2014). Such development is salient given that emotion dysregulation predicts worse mental health symptomology in adolescents (te Brinke et al., 2021). Further, emotion regulation can increase cognitive demand and diminish executive functioning ability (Koay & Meter, 2023). Taken with the hot versus cool distinction in executive functioning research, emotion regulation development appears to precede executive functioning development and serve as a requisite for "executive" tasks.

Current study

Adolescence is a sensitive period for socioemotional development and is characterized by nuanced changes in executive functioning, affect, emotion regulation, and HiTOP spectra (Costello et al., 2011; Cracco et al., 2017; Laureys et al., 2022). While executive functioning predicts functioning across all life-domains (Chaku et al., 2022; Diamond, 2013), there is disagreement regarding assessment approach. Different approaches may yield different research and clinical findings. This study examines transdiagnostic processes on executive function assessment in a community sample of adolescents. We assessed concurrent and longitudinal correlations between executive functioning and transdiagnostic processes associated with executive functioning and psychopathology (i.e., affect, HiTOP spectra, and emotion regulation) using multiple assessment approaches and informants (i.e., self-report, parent-report, and behavioral performance). While primarily exploratory, we expected small to moderate correlations between executive functioning and variables assessing affect, emotion regulation, and HiTOP spectra. We also expect correlations to differ based on the method of assessment (i.e., behavioral versus report) and informant (i.e., self-report versus parent-report).

Methods

Participants

Participants included adolescents in a longitudinal study examining familial effects on adolescent emotion regulation and neurodevelopment. Families were eligible for participation if they (1) included an adolescent entering/currently enrolled in seventh or eighth grade during year 1, (2) had a second adolescent who was 1–4 years older than the younger adolescent, and (3) lived in west Texas. Year 1 comprised 102 community adolescents aged 14.5 years old on average ($SD = 1.6$, Range = 12–18.7) across 51 families. Participants identified as White ($n = 66$), Hispanic or Latino ($n = 66$), American Indian or Alaska Native ($n = 10$), Asian or Asian-American ($n = 6$), Black or African-American ($n = 3$), and Native Hawaiian or Pacific Islander ($n = 2$), with 18 of these adolescents identifying as multiracial (indicating more than one ethnic-racial identity). They predominantly identified as heterosexual (88%) cisgender boys/men (55%) and girls/women (38%). Most adolescent participants (88%; $n = 90$) returned 1 year later, who were on average 15.5 years old ($SD = 1.6$, Range = 13.2–18.8). Returning adolescents did not significantly differ in age, sexual orientation, or gender identity; however, significantly fewer adolescents who identified as Hispanic or Latino returned at year 2 (i.e., 3% versus 26%). While Hispanic or Latino adolescents were less likely to return, this small effect size ($\varphi = -.25$) is unlikely to have impacted results.

Although adolescent reading levels were not assessed in this study, all adolescents came from a community sample and ranged between seventh grade and twelfth grade at both time points. Parents verified during a recruitment call that their children's grade reflected their reading level and that their children had not been

diagnosed with any cognitive or developmental disabilities. During sessions, adolescents were provided with a definition sheet for terms used in the questionnaires. Two participants were removed for skewing data on behavioral measures, resulting in a final sample size of 100.

Behavioral measures

Trail Making Test

This study used Trail Making Test Form B (TMT-B), which requires that adolescents draw lines alternating between ascending numbers and letters. TMT is scored by the amount of time taken to complete the task (i.e., TMT-B in this study) as well as the number of errors made on the task (i.e., TMT-B errors in this study). Despite serving as a common neurocognitive screener, TMT does not have norms for adolescent populations. TMT-B broadly assesses attention, processing speed, motor functioning, and switching/flexibility.

Verbal Executive Measures

This study used two commonly used screeners of adult verbal fluency: the FAS and Animal Naming Test (ANT). The ANT consists of adolescents producing as many animals as possible within 60 seconds. Repeated animals are counted as repetition errors. The FAS comprises three 60-second trials wherein adolescents produce as many words starting with the target letter (i.e., F, A, and S) as possible in 60 seconds. Proper nouns and varied endings (e.g., eat and eating) are counted as set-loss errors, and repeated words are counted as repetition errors. These measures have been identified as "verbal executive tasks" by prior factor analytic research because they significantly load on executive functioning and use some basic executive ability (e.g., inhibition, working memory, shifting; Aita et al., 2019). Notably, the only norms available for adolescents include a sample of 19 adolescents aged 16-years-old and above (see Tombaugh et al., 1999).

Informant-report measures

Behavioral Rating Inventory of Executive Functioning (BRIEF)

The BRIEF is a report-inventory of executive dysfunction assessing behaviors from the prior 2 months in adolescents aged 11 through 18 with at least a fifth-grade reading level. The BRIEF has subscales measuring inhibition, shifting, emotional control, initiative, working memory, planning, organization, and monitoring. These scales form two higher order dimensions (i.e., metacognition and behavioral regulation) and one broad global executive score. Higher scores on the BRIEF indicate greater issues with executive functioning (Guy et al., 2004). This study used a short, 24-item form of the BRIEF. Questions ask about how often the adolescent engages in a target behavior, and the reported answers the frequency ranging from 1 = *never*, 2 = *sometimes*, and 3 = *often*. Adolescents took a self-report form of the BRIEF (BRIEF-SR), and scale reliabilities ranged from mediocre to excellent (α = .60–.90). Parents completed a BRIEF for each adolescent (BRIEF-PR), and scale reliabilities were acceptable to excellent (α = .77–.92).

Child Behavioral Checklist (CBCL)

The CBCL/6–18 is a parent-report inventory of their adolescent's mental health and behavioral problems. Only the six subscales that are DSM-oriented were included in the current study: affective problems (12 items), anxiety problems (6 items), somatic problems (7 items), attention deficit hyperactivity symptoms (8 items), oppositional defiant symptoms (5 items), and conduct problems (17 items), with higher scores indicating greater perceptions of each behavior (Achenbach & Rescorla, 2001; Achenbach et al., 2001). These scales include 54 of the original 112 CBCL/6–18 items (Achenbach et al., 2001), but the current study only included 53 as item #91, "Talks about killing self," from the affective problems scale was excluded due to IRB concerns. Questions list a trait or behavior and ask the parent how true it is of the target adolescent in the past month. Parents respond with 0 = *not true*, 1 = *somewhat/sometimes true*, or 2 = *often true/very true*. This study used a shortened 54-item form of the CBCL/6–18 and parceled the oppositional defiant and conduct problems scales into a measure of broad externalization. Scale reliabilities ranged from satisfactory to good (α = .67 – .87). Questions list a trait or behavior and ask the parent how true it is of the target adolescent. Parents respond with 0 = *not true*, 1 = *somewhat/sometimes true*, or 2 = *often true/very true*.

Difficulties with Emotion Regulation Scale (DERS)

The DERS is a 36-item self-report inventory that assesses emotion dysregulation across six subscales: lack of emotional awareness, lack of emotional clarity, difficulties controlling impulsive behaviors when stressed, difficulties engaging in goal-directed behavior when distressed, nonacceptance of negative emotional responses, and limited access to effective emotion regulation strategies. Questions list a statement, and adolescents respond on a 5-point Likert scale ranging from 1 = *almost never* to 5 = *almost always*. Higher scores indicate greater emotion dysregulation (Gratz & Roemer, 2004). This study used a total score at each

time point for parsimony. Notably, adolescents were administered a shortened form of the DERS at year 2. Reliabilities for these scales were both good (α = .81–.82)

Emotion Regulation Questionnaire (ERQ)

The ERQ is a 10-item self-report questionnaire that assesses regulation of negative and positive emotions. Items list a regulation strategy, and adolescents respond on a 5-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. The scale in the current study is shorter than the original ERQ, which uses a 7-point Likert scale. The modification was revised to match the adolescent version. The ERQ contains two subscales measuring cognitive reappraisal (six items) and emotion suppression (four items) use, and higher scores indicate greater use of the respective strategy (Gross & John, 2003). Cognitive reappraisal showed satisfactory reliability (α = .73–.79), whereas emotion suppression's reliability was acceptable at both time points (α = .64–.67).

Minnesota Multiphasic Personality Inventory-Adolescent- Restructured Form (MMPI-A-RF)

The MMPI-A-RF is a broadband personality assessment that measures adolescent psychopathology. The MMPI-A-RF contains 241 dichotomous items that comprise 48 scales, normed on adolescents between 14 and 18 years old above a 4.9th grade reading level (Archer et al., 2016). While this study includes 13-year-old adolescents, these adolescents were above a fifth grade reading level and high functioning. This study used the three higher order scales measuring internalizing (EID), externalizing (BXD), and thought disorder (THD), as well as restructured clinical scales that assess affect (RCd) and somatic complaints (RC1), with higher scores indicating greater endorsement of each area of psychopathology. Although the MMPI-A-RF contains a number of clinically relevant scales, these five scales were chosen to provide a conceptual framework consistent with the organization of the HiTOP spectra (Sellbom, 2019; Sellbom et al., 2021). These scales had satisfactory to excellent reliability (α = .78–.93)

Positive Affect Negative Affect Scale (PANAS)

The PANAS is a 10-item self-report scale measuring positive and negative affect (5 items each). Adolescents rate the degree to which they felt an emotion over the past week on a 5-point Likert scale, ranging from 1 = *never* to 5 = *always*, with higher scores indicating greater experiences of positive or negative affect for each respective subscale (Thompson, 2007). Both scales had good reliability across time points (α = .80–.88).

Procedure

The study was approved by Texas Tech University's Institutional Review Board. Data collection occurred between July 2022 and December 2024. Recruitment occurred via flyers, social media postings, and e-mail listservs. Families eligible for participation were contacted through their preferred communication method. Parent consent and adolescent assent were obtained at both time points. During year 1 (Y1), adolescents underwent observation tasks and completed the DERS, ERQ, and PANAS, while the parent completed the CBCL for each adolescent. Older adolescents were then administered the MMPI-A-RF, while the younger adolescents underwent Magnetic Resonance Imaging.

Families were contacted 1 year after their initial session to return. At year 2 (Y2), adolescents completed the BRIEF-SR, MMPI-A-RF, DERS, ERQ, and PANAS. Research assistants then administered the TMT, ANT, and FAS, and these screeners were scored by the first author under the supervision of a licensed Psychologist (second author). Parents also completed the CBCL and BRIEF for each adolescent at year 2. Families were compensated $100 for each session ($40 per adolescent; $20 for the parent).

Data analytic plan

Two outliers (> 3 SD above the mean) were removed for skewing data on TMT-B, resulting in a final sample size of 100. Bivariate correlations were calculated across self-report, parent-report, and behavioral measures across both timepoints. Specifically, correlations were conducted across (1) measures of executive functioning at Y2, (2) behavioral assessment of executive functioning at Y2 and transdiagnostic processes at Y1 and Y2, (3) adolescent report of executive functioning at Y2 and transdiagnostic processes at Y1 and Y2, and (4) parent report of executive functioning at Y2 and transdiagnostic processes at Y1 and Y2. An a priori α value of .05 was set prior to analyses to determine statistical significance. Notably, corrections for multiple comparisons were not made due to the small sample size in this study (n = 50–100). This sample size also prohibited the inclusion of covariates like age, gender, and socioeconomic status. Ferguson's (2009) guidelines for practical effect sizes were selected to account for

Table 1. Descriptive statistics.

	Year One						Year Two					
Behavioral	n	*M*	*SD*	Range	Min	Max	n	*M*	*SD*	Range	Min	Max
TMT-B	–	–	–	–	–	–	82	74.73	29.47	204	25	229
TMT-B Errors	–	–	–	–	–	–	82	0.52	0.85	3	0	3
FAS Correct	–	–	–	–	–	–	88	28.67	9.26	52	7	59
FAS Set Loss	–	–	–	–	–	–	88	0.92	1.52	8	0	8
Animal Naming	–	–	–	–	–	–	88	21.07	6.11	25	10	35
Animal Repetition	–	–	–	–	–	–	88	0.27	0.69	4	0	4
Self-Report												
Inhibition	–	–	–	–	–	–	87	5.32	1.55	6	3	9
Shifting	–	–	–	–	–	–	87	5.85	1.54	6	3	9
Emotional Control	–	–	–	–	–	–	87	5.46	1.85	6	3	9
Working Memory	–	–	–	–	–	–	87	7.61	2.31	8	4	12
Organization of Materials	–	–	–	–	–	–	88	5.33	1.52	6	3	9
Monitor	–	–	–	–	–	–	88	5.2	1.4	6	3	9
Initiate	–	–	–	–	–	–	86	3.97	1.09	4	2	6
Planning	–	–	–	–	–	–	88	5.75	1.76	6	3	9
Behavioral Regulation	–	–	–	–	–	–	87	16.63	3.81	18	9	27
Metacognition	–	–	–	–	–	–	86	27.87	6.23	28	15	43
Global Executive	–	–	–	–	–	–	86	44.55	9.03	37	25	62
EID	50	51.44	14.27	50	32	82	87	50.45	11.38	48	32	80
BXD	50	41.82	7.64	33	32	65	87	42.68	7.42	43	29	72
THD	50	49.6	11.21	49	37	86	87	49.76	10.59	54	37	91
RCd	50	51.78	13.99	50	34	84	87	50.06	10.65	43	34	77
RC1	50	53.42	13.46	61	33	94	87	51.33	11.84	58	33	91
PANAS Positive Affect	97	14.82	4.67	20	5	25	88	14.81	4.45	19	5	24
PANAS Negative Affect	97	10.92	4.92	20	5	25	88	10.36	4.29	20	5	25
ERQ Cognitive Reappraisal	99	21.09	3.82	20	10	30	88	21.38	3.91	20	10	30
ERQ Emotion Suprresion	99	12.42	3.22	14	5	19	88	12.11	2.95	16	4	20
DERS Total Score	98	94.98	23.7	111	41	152	88	47.64	12.41	65	18	83
Parent-Report												
Inhibition	–	–	–	–	–	–	69	3.86	1.24	6	3	9
Shifting	–	–	–	–	–	–	69	4.41	1.28	5	3	8
Emotional Control	–	–	–	–	–	–	69	4.52	1.61	6	3	9
Working Memory	–	–	–	–	–	–	69	6.36	2.2	8	4	12
Organization of Materials	–	–	–	–	–	–	69	6.09	2.08	6	3	9
Monitor	–	–	–	–	–	–	69	4.94	1.81	6	3	9
Initiate	–	–	–	–	–	–	69	3.42	1.24	4	2	6
Planning	–	–	–	–	–	–	69	4.48	1.54	6	3	9
Behavioral Regulation	–	–	–	–	–	–	69	12.78	3.3	14	9	23
Metacognition	–	–	–	–	–	–	69	25.29	7	27	15	42
Global Executive	–	–	–	–	–	–	69	38.07	9.1	35	24	59
CBCL Negative Affect	100	1.92	2.54	12	0	12	87	2.24	2.82	15	0	15
CBCL Anxiety	100	1.05	1.47	7	0	7	87	1.28	1.51	7	0	7
CBCL Somatic Complaints	100	1.08	1.67	7	0	7	87	1.01	1.58	9	0	9
CBCL Attention	100	1.89	2.31	11	0	11	87	1.79	2.42	14	0	14
CBCL Externalizing	100	2.47	3.73	20	0	20	87	2.51	3.5	15	0	15

TMT = Trail Making Test; MMPI-A-RF = Minnesota Multiphasic Personality Inventory-Adolescent-Restructured Form; PANAS = Positive Affect, Negative Affect Scale; ERQ = Emotion Regulation Questionnaire; DERS = Difficulties with Emotion Regulation Scale; CBCL = Child Behavior Checklist.

mono-method assessment as well as the possibility of spurious correlations. These guidelines set correlations of .2, .5, and .8 as small, moderate, and large, respectively. Because no corrections were made for multiple comparisons, effect sizes were the focus of interpretation in this study. Descriptive statistics, including the sample size for each measure, are outlined in Table 1.

Results

Multi-informant multi-method correlations of executive functioning

Self and parent reports of adolescent executive functioning had moderate agreement ($r = .30–.49$) on all functions except inhibition, emotional control, and behavioral regulation (see Table 2). Further, self-reported monitoring showed small and positive correlations across most parent-reported domains ($r = .26–.44$; excluding emotional control and organization of materials). Self- and parent-reported executive functioning mostly did not correlate with behavioral measures. Parent-reported issues with working memory negatively correlated with FAS total correct scores at a small effect ($r = –.24$). In addition, self-reported executive functioning correlates were in unexpected directions: worse emotional control correlated with FAS correct total score ($r = .22$) and worse planning negatively and moderately correlated with TMT-B errors ($r = –.24$) at small effects. FAS set loss errors negatively correlated with

Table 2. Multi-informant multi-method correlations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Behavioral (Y2)																												
TMT-B (1)	1*																											
TMT-B Errors (2)	.5*	1*																										
FAS Correct (3)	−.31*	−.03	1*																									
FAS Set Loss (4)	−.05	.21	.20	1*																								
Animal Naming (5)	−.31*	−.05	.47*	.12	1*																							
Animal Repetition (6)	.13	.15	.02	.24*	.13	1*																						
Self-Report (Y2)																												
Inhibition (7)	−.09	−.11	−.05	−.16	−.05	.02	1*																					
Shifting (8)	−.11	.05	.10	−.12	.06	.09	.39*	1*																				
Emotional Control (9)	.08	.16	.22*	.13	.05	.06	.45*	.33*	1*																			
Working Memory (10)	−.04	−.01	−.20	−.24*	−.18	.07	.42*	.48*	.12	1*																		
Organization of Materials (11)	.21	.04	−.04	−.18	−.11	.14	.36*	.36*	.34*	.5*	1*																	
Monitor (12)	−.08	−.21	−.08	−.13	−.09	.19	.47*	.28*	.26*	.39*	.44*	1*																
Initiate (13)	−.08	−.01	−.04	−.17	−.10	.15	.4*	.43*	.32*	.62*	.51*	.33*	1*															
Planning (14)	−.06	−.24*	−.13	−.19	−.01	.09	.52*	.27*	.26*	.64*	.44*	.47*	.51*	1*														
Behavioral Regulation (15)	−.04	.05	.13	−.05	.03	.08	.78*	.72*	.8*	.43*	.46*	.43*	.49*	.45*	1*													
Metacognition (16)	−.01	−.09	−.14	−.23*	−.12	.16	.57*	.49*	.33*	.86*	.73*	.65*	.74*	.81*	.59*	1*												
Global Executive (17)	−.03	−.04	−.04	−.18	−.08	.14	.72*	.64*	.57*	.79*	.7*	.64*	.72*	.75*	.83*	.94*	1*											
Parent-Report (Y2)																												
Inhibition (18)	−.14	−.03	−.13	.06	.06	−.14	.02	.05	−.10	.06	.11	.26*	−.07	.04	−.02	.08	.05	1*										
Shifting (19)	−.06	−.02	.21	−.04	.01	−.03	.15	.3*	.09	.02	.10	.28*	.03	.02	.22	.07	.15	.21	1*									
Emotional Control (20)	−.11	.04	.12	.01	.06	−.18	.07	.20	.18	.09	.16	.20	.00	.02	.19	.09	.15	.51*	.59*	1*								
Working Memory (21)	.10	.12	−.24*	−.20	−.23	.02	.18	.09	−.13	.49*	.27*	.44*	.25*	.26*	.05	.43*	.33*	.32*	.20	.3*	1*							
Organization of Materials (22)	.01	.08	−.08	−.05	−.06	−.04	.07	.14	−.06	.32*	.39*	.14	.31*	.11	.06	.32*	.25*	.22	.19	.31*	.43*	1*						
Monitor (23)	−.06	−.03	.00	.03	.05	−.03	.10	.19	−.03	.20	.18	.44*	.12	.25*	.10	.27*	.24	.57*	.39*	.5*	.56*	.48*	1*					
Initiate (24)	.01	.03	−.11	−.18	−.13	.02	.00	.20	−.25*	.39*	.25*	.32*	.31*	.19	−.03	.36*	.24	.15	.31*	.29*	.74*	.44*	.5*	1*				
Planning (25)	.14	.10	−.18	−.03	−.11	.01	.17	.04	−.07	.33*	.20	.41*	.17	.3*	.05	.34*	.27*	.46*	.19	.28*	.67*	.42*	.55*	.5*	1*			
Behavioral Regulation (26)	−.13	.00	.09	.01	.06	−.15	.10	.23	.08	.07	.16	.31*	−.02	.03	.17	.10	.15	.71*	.76*	.91*	.34*	.31*	.61*	.32*	.39*	1*		
Metacognition(27)	.05	.08	−.16	−.11	−.12	−.01	.14	.16	−.13	.44*	.34*	.44*	.3*	.28*	.06	.44*	.35*	.44*	.32*	.43*	.87*	.73*	.78*	.78*	.79*	.5*	1*	
Global Executive (28)	−.01	.06	−.09	−.08	−.08	−.06	.14	.21	−.07	.37*	.32*	.45*	.23	.23	.11	.38*	.32*	.59*	.52*	.66*	.79*	.67*	.83*	.71*	.74*	.74*	.95*	1*

Y2 = year two; TMT = Trail Making Test; triangle outlines denote mono-method mono-informant correlations.
*= $p < .05$. All correlations tested at this level. Two-tailed significance.

self-reported issues with working memory ($r = -.24$) and metacognition ($r = -.23$) at small effects.

Behavioral executive functioning and transdiagnostic correlations

Concurrent parent-reported negative affect positively correlated with TMT-B errors ($r = .22$), and concurrent emotional suppression was negatively associated with TMT-B duration ($r = -.23$; Table 3) at small effects. Self-reported negative affect showed a small correlation with FAS correct score ($r = .31$). While emotion dysregulation did not correlate with behavioral performance, concurrent use of cognitive reappraisal exhibited a small association with FAS set loss errors ($r = -.22$). FAS set loss errors negatively correlated with year 1 self-reported internalizing symptoms ($r = -.40$), somatic symptoms ($r = -.31$), and demoralization ($r = -.36$) at small effects. Self-reported concurrent somatic complaints showed a small, negative correlation with ANT total score ($r = -.28$), and self-reported positive affect showed a small, negative correlation with ANT repetition errors ($r = -.22$).

Self-report executive functioning and transdiagnostic correlations

Concurrent self-reported internalizing and externalizing symptoms and demoralization broadly correlated with executive functioning at small to moderate effects ($r = .28$–$.55$; see Table 4). While year 1 internalizing symptoms and demoralization showed small to moderate positive correlations with executive functioning ($r = .30$–$.63$), externalizing symptoms only correlated with inhibition ($r = .42$) and behavioral regulation ($r = .34$) at small effects. Thought disorder symptoms saw small to moderate correlations at both time points with all functions except working memory, initiate, planning, and metacognition ($r = .27$–$.57$). Self-reported somatic complaints also had small to moderate correlations with most functions at both time points ($r = .27$–$.51$) save for inhibition, which correlated longitudinally ($r = .38$), and working memory, which correlated concurrently ($r = .27$), monitor, initiate, and planning.

Self-reported negative affect had small to moderate correlations with most self-reported executive functions ($r = .22$–$.54$) at all time points. Monitoring and working memory, however, only correlated longitudinally ($r = .22$) at a small effect; planning only correlated concurrently ($r = .22$) at a small effect. Concurrent positive affect showed a small and negative correlation with self-reported working memory ($r = -.24$). Emotion dysregulation showed small to moderate positive correlations with all executive functions across both time points ($r = .24$–$.69$). Use of cognitive reappraisal negatively correlated with emotional control ($r_{y1} = -.25$, $r_{y2} = -.32$), behavioral regulation ($r_{y1} = -.22$, $r_{y2} = -.26$), and global executive ability ($r_{y1} = -.22$, $r_{y2} = -.26$) at small effects across both time points. Concurrent cognitive reappraisal saw small, negative correlations with monitoring ($r = -.23$) and metacognition ($r = -.23$). Year 1 emotional suppression showed small correlations with year 2 monitor ($r = .23$) and planning ($r = .23$). Concurrent emotional suppression had small positive correlations with emotional control ($r = .32$) and behavioral regulation ($r = .29$).

Parent-reported negative affect exhibited small associations with self-report of organization of materials ($r_{y1} = .34$, $r_{y2} = .28$), initiating ($r_{y1} = .24$, $r_{y2} = .26$), planning ($r_{y1} = .23$, $r_{y2} = .21$), metacognition ($r_{y1} = .31$, $r_{y2} = .26$), and global executive ability ($r_{y1} = .29$, $r_{y2} = .28$) at both times; whereas parent-reported concurrent affect showed small correlations with self-report emotional control ($r = .27$) and behavioral regulation ($r = .23$). Self-reported monitoring correlated with parent-reported externalizing symptoms at both time points ($r_{y1} = .22$, $r_{y2} = .27$) at small effects.

Parent-report executive functioning and transdiagnostic correlations

Parent-reported shifting showed small correlations with year 1 self-reported internalizing symptoms ($r = .33$) and somatic complaints ($r = .31$; see Table 5). Year 1 self-reported externalizing symptoms correlated with later parent-reported inhibition ($r = .34$) and behavioral regulation ($r = .32$) at small effects. Concurrent self-reported externalizing symptoms, however, exhibited small associations with parent-reported working memory ($r = .28$), monitoring ($r = .38$), planning ($r = .33$), and global executive ability ($r = .33$). Concurrent self-reported positive affect showed small, negative correlations with parent-reported working memory ($r = -.28$), initiating ($r = .32$), planning ($r = -.24$), and metacognition ($r = .27$). Year 1 self-reported cognitive reappraisal exhibited a small correlation with year 2 parent-reported inhibition ($r = .32$). However, self-reported negative affect, emotion regulation strategies, and emotion dysregulation did not evidence other correlations.

Parent-reported externalizing symptoms had small to moderate associations with all executive functions ($r = .25$–$.61$) at both time points except organization of materials, which only correlated at year 1 ($r = .33$). Year 1 parent-reported anxiety correlated with year 2 emotional control ($r = .3$) and planning ($r = .34$) at small effects; concurrent parent-reported anxiety correlated with shifting (r

Table 3. *Correlates with year* 2 behavioral performance.

	MMPI-A-RF										PANAS			DERS		
	Internalizing		Externalizing		Thought Disorder		Demoralization		Somatic Complaints		Positive Affect		Negative Affect	Total		
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2
Y2 TMT-B	.08	−.07	.16	−.07	.01	−.04	.03	−.13	.08	.20	.12	−.01	.08	.03	.04	−.06
Y2 TMT-B Errors	−.03	.01	−.09	−.08	−.17	−.07	−.08	.01	−.08	.14	−.11	−.08	.07	.10	.15	.03
Y2 FAS Correct	.16	.19	−.13	−.01	−.13	−.04	.09	.20	.13	.00	.08	.09	.15	.31*	.12	.18
Y2 FAS Set Loss	−.4*	−.16	−.10	−.09	−.28	.00	−.36*	−.09	−.31*	−.06	.01	−.14	−.17	−.06	−.11	.02
Y2 Animal Naming	−.03	−.03	−.21	−.05	.00	−.05	−.09	−.02	−.09	−.28*	−.07	.00	−.01	−.01	−.02	.08
Y2 Animal Repetition	−.10	.11	−.10	−.02	−.04	−.04	−.04	.10	−.10	.08	−.18	−.22*	−.03	.09	−.01	.09
	CBCL												ERQ			
	Affect		Anxiety		Somatic		Attention		Externalizing		Cognitive Reappraisal		Emotion Suppression			
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2		
Y2 TMT-B	.14	.13	.19	.17	.10	.19	.09	.10	−.01	.09	.00	.02	−.20	−.23*		
Y2 TMT-B Errors	.05	.22*	−.01	.15	.06	.09	.04	.14	−.19	−.02	.08	−.15	−.13	−.12		
Y2 FAS Correct	.02	.12	.01	.10	.08	−.02	−.14	−.10	−.05	−.06	−.06	−.17	.07	.15		
Y2 FAS Set Loss	.05	.08	.05	.07	−.12	.05	−.02	−.07	−.12	−.08	.00	−.22*	−.02	−.02		
Y2 Animal Naming	.13	.18	−.05	−.06	.05	−.04	−.11	−.05	−.02	−.05	−.17	−.10	−.09	.01		
Y2 Animal Repitition	.10	.17	−.08	.15	.19	.17	−.12	−.04	−.03	.00	−.01	−.12	−.01	−.02		

Y2 = year two; TMT = Trail Making Test; MMPI-A-RF = Minnesota Multiphasic Personality Inventory-Adolescent-Restructured Form; PANAS = Positive Affect, Negative Affect Scale; ERQ = Emotion Regulation Questionnaire; DERS = Difficulties with Emotion Regulation Scale; CBCL = Child Behavior Checklist.
*= $p < .05$. All correlations tested at this level. Two-tailed significance.

Table 4. *Correlates with year* 2 self-reported executive dysfunction.

	MMPI-A-RF										PANAS				DERS	
	Internalizing		Externalizing		Thought Disorder		Demoralization		Somatic Complaints		Positive Affect		Negative Affect		Total	
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2
Y2 Inhibition	.44*	.28*	.42*	.48*	.57*	.4*	.5*	.29*	.38*	.17	−.03	.06	.35*	.32*	.41*	.43*
Y2 Shifting	.49*	.49*	.25	.4*	.4*	.27*	.48*	.43*	.33*	.26*	−.08	.00	.39*	.39*	.36*	.51*
Y2 Emotional Control	.61*	.45*	.18	.26*	.4*	.32*	.58*	.41*	.51*	.35*	.07	−.07	.47*	.51*	.43*	.62*
Y2 Working Memory	.34*	.37*	.06	.23*	.15	.06	.3*	.31*	.19	.27*	−.14	−.24*	.22*	.19	.25*	.4*
Y2 Organization of Materials	.52*	.41*	.26	.28*	.36*	.26*	.54*	.33*	.47*	.29*	.11	−.07	.44*	.31*	.42*	.45*
Y2 Monitor	.33*	.28*	.17	.3*	.33*	.27*	.35*	.23*	.23	.09	−.11	−.08	.18	.17	.25*	.4*
Y2 Initiate	.30	.48*	−.04	.21	.14	.10	.36*	.47*	.24	.16	−.16	−.11	.31*	.33*	.34*	.42*
Y2 Planning	.3*	.35*	.08	.33*	.24	.16	.33*	.35*	.25	.20	−.06	−.15	.21	.22*	.24*	.38*
Y2 Behavioral Regulation	.63*	.53*	.34*	.49*	.55*	.43*	.64*	.49*	.5*	.34*	−.01	−.01	.53*	.54*	.52*	.69*
Y2 Metacognition	.45*	.48*	.05	.34*	.30	.21	.47*	.43*	.33*	.26*	−.12	−.21	.34*	.31*	.38*	.56*
Y2 Global Executive	.57*	.55*	.21	.44*	.43*	.32*	.58*	.5*	.44*	.32*	−.09	−.15	.46*	.44*	.48*	.67*
	CBCL												ERQ			
	Affect		Anxiety		Somatic		Attention		Externalizing		Cognitive Reappraisal		Emotion Suppression			
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2		
Y2 Inhibition	.11	.11	−.02	−.05	−.02	.03	0.2	.15	.12	.13	−.16	−.07	.14	.15		
Y2 Shifting	.13	.14	.01	.11	.11	.13	.05	.09	.00	.00	−.09	−.20	.17	.18		
Y2 Emotional Control	.16	.27*	.07	.05	.16	.17	−.05	−.03	−.02	.14	−.25*	−.32*	.04	.32*		
Y2 Working Memory	.20	.16	.13	.09	.06	.07	.28*	.27*	.08	.03	−.07	−.09	.06	−.10		
Y2 Organization of Materials	.34*	.28*	.16	.28*	.16	.05	.38*	.32*	.15	.14	−.17	−.11	.14	.01		
Y2 Monitor	.26*	.15	.05	.09	.05	.01	.34*	.34*	.22*	.27*	−.06	−.23*	.23*	.08		
Y2 Initiate	.24*	.26*	−.03	.02	.10	.02	.25*	.18	.18	.09	−.18	−.17	.14	.16		
Y2 Planning	.23*	.21*	.00	.02	.13	.23*	.17	.13	.14	.13	−.15	−.15	.23*	.01		
Y2 Behavioral Regulation	.17	.23*	.03	.05	.11	.14	.08	.08	.04	.12	−.22*	−.26*	.14	.29*		
Y2 Metacognition	.31*	.26*	.06	.11	.13	.11	.34*	.3*	.15	.12	−.18	−.23*	.20	.03		
Y2 Global Executive	.29*	.28*	.07	.10	.14	.14	.29*	.28*	.14	.15	−.22*	−.26*	.20	.14		

Y2 = year two; MMPI-A-RF = Minnesota Multiphasic Personality Inventory-Adolescent-Restructured Form; PANAS = Positive Affect, Negative Affect Scale; ERQ = Emotion Regulation Questionnaire; DERS = Difficulties with Emotion Regulation Scale; CBCL = Child Behavior Checklist.
*= $p < .05$. All correlations tested at this level. Two-tailed significance.

= .27), monitor (r = .27), and behavioral regulation (r = .25) at small effects. Concurrent parent-reported somatic complaints showed a small correlation with emotional control (r = .25). Concurrent parent-reported negative affect had small correlations with executive functioning (r = .24–.34) save for inhibition and shifting. Parent-reported negative affect at year one was also had small correlations with year 2 executive functioning (r = .29–.44) except for inhibition, shifting, emotional control, and behavioral regulation. These patterns mirror those observed for self-reported executive functioning wherein parent reports correlated with outward facing adolescent symptoms (e.g., self-reported externalizing symptoms and affect) and other parent-reported symptoms.

Discussion

This study examined how three different transdiagnostic processes were associated with executive functioning concurrently and longitudinally during adolescence across different informants (i.e., adolescent and parent). Specifically, we examined how HiTOP spectra, affect, and emotion regulation were related to executive function using multiple methods (i.e., informant report and behavioral performance). Broadly, this longitudinal multi-informant multi-method study highlights that (1) assessment approaches often diverge but can converge in some specific and useful ways when assessing externalizing symptoms and affect; (2) negative affect likely associate with executive function performance concurrently, and across time and methodological approach; and (3) internalizing symptoms can evidence the strongest associations with adolescent self-reported executive functioning problems, whereas externalizing symptoms have the potential as the largest associations for parent-reported executive functioning problems.

As expected (e.g., Rahbari & Vaillancourt, 2015/2015), correlates of executive function were inconsistent between methods and informants. For example, behavioral measures had few meaningful associations with self- and parent-reported executive functions. This dearth of associations should temper reliance on one assessment approach when examining behavior and encourages clinicians to use multiple methods and informants when assessing adolescent executive functioning. Conversely, shared method tasks tended to be stronger, like the moderate associations between verbal executive tasks (i.e., FAS and ANT) and moderate associations across self-reported executive functioning and concurrent mental health symptoms. Notably, self-reported and parent-reported executive functioning moderately agreed, suggesting parents and adolescents broadly converge when assessing adolescent executive functioning. The divergence among assessment methods highlights the need for future studies examining executive functioning to use multi-informant multi-method approach to ascertain consistencies and inconsistencies among measures. Neuropsychologists are recommended to identify converging patterns of adolescent executive functioning when conducting assessments and making treatment recommendations, especially if results from informant-report, self-report, and behavioral performance agree.

Self- and parent-reported externalizing symptoms were associated with poorer executive function task performance 1 year later, likely reflecting impulse-related psychopathology HiTOP (e.g., as described in HiTOP, Kotov et al., 2017) as a salient transdiagnostic process in adolescent executive functioning across time. Accordingly, when adolescents make errors on screening measures (e.g., set loss and commission mistakes), neuropsychologists may anticipate broader difficulties in behavioral control and inhibition across tests. Still, "worse executive functioning" can mean different things (e.g., higher error rates, set loss, slower responses), and not all error types consistently map onto externalizing psychopathology across informants. Given the small sample, a single error on a single test should not be over-interpreted.

Self- and parent-report of regulation and affect were also associated with worse executive functioning, with similar error-type caveats noted above. Specifically, self-reported internalizing symptoms, demoralization, dysregulation, and negative affect had the most prominent associations with later adolescent executive functioning. One interpretation includes that the BRIEF may measure emotional dysfunction instead of executive dysfunction (Shwartz et al., 2020), consistent with the need for improved assessment in adolescents (De Los Reyes et al., 2015). More likely, these associations may highlight the role of affective components in executive tasks during adolescence (e.g., Perino et al., 2016), including "cool" executive functions. This interpretation is also consistent with research suggesting cognitive demand of emotion inhibits executive performance (Koay & Meter, 2023). In high-risk assessments (e.g., child sexual abuse), careful monitoring of affect is critical. Adolescents involved in juvenile justice systems, for instance, have often experienced numerous, repeated traumas (Abram et al., 2004) and may be emotionally dysregulated as a result (Livanou et al., 2019). Attending to adolescents' emotional states is vital, as internal experiences are often misreported to adults (Smetana et al., 2006; Vijayakumar & Pfeifer, 2020), particularly in the case of minoritized persons (Goldberg & Gabriele-Black, 2024; see; Dixon et al.,

Table 5. *Correlates with year* 2 parent-reported executive dysfunction.

	MMPI-A-RF										PANAS				DERS	
	Internalizing		Externalizing		Thought Disorder		Demoralization		Somatic Complaints		Positive Affect		Negative Affect		Total	
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2
Y2 Inhibition	−.10	−.12	.34*	.16	.17	.03	−.06	−.11	.01	−.09	−.06	.00	.02	−.21	−.06	.06
Y2 Shifting	.33*	.20	.23	.18	.14	.14	.28	.15	.31*	.00	−.04	−.13	.23	.12	.23	.18
Y2 Emotional Control	.22	.11	.24	.17	.07	.05	.19	.09	.16	−.02	−.01	−.04	.24	.15	.23	.25*
Y2 Working Memory	.25	.12	.22	.28*	.14	−.09	.23	.09	.13	.13	−.22	−.28*	.09	−.09	.08	.08
Y2 Organization of Materials	.08	.11	−.08	.17	.10	.06	.02	.09	.08	−.01	.01	−.09	.04	.02	.05	.05
Y2 Monitor	.05	.02	.13	.38*	.11	.03	.04	.04	.06	−.09	−.22	−.17	.04	−.16	.09	.11
Y2 Initiate	.26	.16	−.07	.14	.02	−.15	.20	.11	.08	.05	−.19	−.32*	.09	−.03	.04	.09
Y2 Planning	.07	−.03	.29	.31*	.19	.00	.11	−.02	.04	−.08	−.13	−.24*	.01	−.13	.00	.07
Y2 Behavioral Regulation	.19	.09	.32*	.22	.15	.09	.17	.06	.19	−.05	−.04	−.08	.22	.04	.18	.21
Y2 Metacognition	.17	.10	.13	.33*	.15	−.03	.14	.08	.10	.00	−.19	−.27*	.07	−.10	.07	.10
Y2 Global Executive	.20	.11	.22	.33*	.17	.01	.17	.08	.15	−.01	−.16	−.23	.13	−.06	.12	.15

	CBCL										ERQ			
	Affect		Anxiety		Somatic		Attention		Externalizing		Cognitive Reappraisal		Emotion Suppression	
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2
Y2 Inhibition	.15	.18	.03	.13	.04	.00	.48*	.52*	.43*	.55*	.32*	.01	.06	.00
Y2 Shifting	.17	.22	.18	.27*	.17	.21	.16	.24*	.3*	.34*	.00	−.19	.09	.01
Y2 Emotional Control	.16	.28*	.3*	.20	.24	.25*	.29*	.48*	.33*	.51*	.09	−.16	.02	−.05
Y2 Working Memory	.35*	.4*	.34*	.31*	.12	.11	.61*	.64*	.48*	.51*	.14	.14	.13	−.08
Y2 Organization of Materials	.29*	.24*	.34*	.29*	.05	−.02	.44*	.38*	.33*	.19	.01	.07	.00	−.13
Y2 Monitor	.41*	.31*	.22	.21	.20	.10	.52*	.52*	.55*	.58*	.04	−.02	.13	−.10
Y2 Initiate	.3*	.46*	.23	.27*	.18	.14	.39*	.41*	.31*	.25*	.10	.04	.06	−.09
Y2 Planning	.38*	.31*	.34*	.19	.07	.03	.56*	.62*	.55*	.5*	.11	.09	.00	−.14
Y2 Behavioral Regulation	.20	.29*	.23	.25*	.20	.20	.39*	.52*	.44*	.58*	.16	−.15	.07	−.02
Y2 Metacognition	.44*	.43*	.38*	.33*	.15	.09	.65*	.66*	.56*	.52*	.10	.09	.09	−.14
Y2 Global Executive	.41*	.43*	.37*	.34*	.19	.14	.64*	.7*	.59*	.61*	.14	.01	.09	−.12

Y2 = year two; MMPI-A-RF = Minnesota Multiphasic Personality Inventory-Adolescent-Restructured Form; PANAS = Positive Affect, Negative Affect Scale; ERQ = Emotion Regulation Questionnaire; DERS = Difficulties with Emotion Regulation Scale; CBCL = Child Behavior Checklist.
*= $p < .05$. All correlations tested at this level. Two-tailed significance.

2023 for an example with the MMPI). Developing skills to engage adolescents during assessment is therefore critical. There are various training programs promoting evidence-based efforts, and these appear to be an effective way to supplement assessment trainings (e.g., De Los Reyes & Kazdin, 2005).

Self-reported executive functioning also associated with parent-reported negative affect and attention, suggesting that adolescents' perceptions of their executive functioning often align with what parents observe. However, neuropsychologists engaging in assessment may consider how adolescents communicate distress and to whom they disclose distress given longstanding concerns about the limits of parent insight into internalizing symptoms (De Los Reyes & Kazdin, 2005; De Los Reyes et al., 2015) – especially among minoritized youth (Hou et al., 2020). Because internalizing problems and emotion regulation capacities are highly variable and still developing during adolescence (Compas et al., 2017; Costello et al., 2011; Maughan et al., 2013), evaluating the parent – adolescent relationship and the extent of adolescent disclosure is critical for accurate neuropsychological assessment of adolescents.

Parent-reported adolescent executive functioning was consistently associated with prior parent-report of externalizing, attention, affect, and anxiety. Turning to adolescent self-report of transdiagnostic processes, several patterns emerge. First, parent-reported inhibition correlated with earlier self-reported externalizing behavior and cognitive reappraisal skills, again emphasizing the role of meta-cognition. While the link between externalizing behavior and poorer inhibition aligns with prior work (e.g., Williams et al., 2009), the inverse association between cognitive reappraisal and disinhibition was unexpected. One possibility is that the cognitive load of reappraisal interferes with behavioral inhibition (Koay & Meter, 2023). Clinicians may therefore benefit by examining adolescents' emotional states during assessment of executive functioning. Second, parent-reported shifting associated with earlier

adolescent-reported internalizing problems and somatic complaints, indicating that preoccupation with such concerns may hinder flexibility. Finally, parent-reported behavioral regulation was associated with earlier adolescent externalizing as reported by both parents and adolescents, echoing existing findings (Aldao et al., 2016). Collectively, these results highlight how assessing parent and adolescent reports across time may aid in neuropsychological evaluations of inhibition, shifting, and behavioral regulation as components of parent-reported executive functioning across time.

Limitations and future directions

Although this study encompassed strengths, such as its longitudinal multi-informant multi-method design, no study is without limitations. First, several characteristics of this sample make it unique and require cross-validation of our findings. We focused on community-sampled adolescents. Correlates between executive functioning and transdiagnostic processes may be more pronounced or salient in clinical populations. The sample also included adolescents under standard MMPI-A-RF administration age of 14. While supplemental analyses suggest that correlations did not differ when including adolescents under the age of 14 versus excluding them ($q = 0$ –.13),[1] findings may be impacted by our modest sample size. The modest sample size also limited statistical power – as only the older adolescent completed the MMPI-A-RF at Year 1— resulting in an emphasis on practical effect size interpretation. Due to sample size limitations, corrections for multiple comparisons were not conducted thereby risking spurious correlations in this study. Moreover, the limited statistical power also prevented the inclusion of potential confounds like age, gender, and socioeconomic status. A larger sample size would improve not only the power of the analyses, but also the generalizability of these findings. The absence of normative data for early adolescence on the behavioral measures limited the ability to contextualize responses and determine clinically meaningful scores. Future work establishing normative data using large, diverse sample sizes is needed for adolescents. This study also used revised measures of executive functioning, like the short form BRIEF and neurocognitive screeners. These revised measures may restrict effect sizes due to lower between-person differences and lower internal consistencies. Lastly, detection of credible responding remains underdeveloped. Nearly half of clinicians do not use performance or symptom validity indicators for assessments they give, including the MMPI-A (Brooks et al., 2016). Moreover, this dearth of research appears despite evidence that systematic response bias emerges as young as 8 (Kirkwood et al., 2010). Most study respondents produced valid profiles though a few elevated either over-reporting (2% year 1; 0% year 2) or under-reporting scales (4% year 1; 2% year 2). Supplemental analyses removing these individuals found no differences in observed correlations ($q = 0$ –.05). Research examining validity scales and how adolescents engage in response distortion in adolescent assessments are needed.

Conclusions

This study examined concurrent and longitudinal transdiagnostic processes that may coincide with adolescent executive functioning using a longitudinal multi-informant multi-method approach. Our findings suggest that the assessment method used in executive functioning research substantially impacts findings. Clinicians using multiple informants are encouraged to examine parent-reported externalizing symptoms, self-reported emotional symptoms, and multi-informant ratings of negative affect as they contribute to the development or maladjustment of executive functioning during adolescence. Moreover, emotion regulation and affect had the most consistent associations with executive functioning across methods and informants, underscoring these transdiagnostic processes as salient in understanding and preventing problems in adolescent executive functioning. Future studies are encouraged to expand upon these associations using more intensive measures with a larger and more representative sample. Moreover, prospective work should examine the role of metacognitive development and parent-adolescent closeness, as these processes transform significantly during the adolescent years and likely contribute to the development and assessment of adolescent executive functioning.

Note

1. Cohen's q is a standardized effect size that measures the difference between two correlations. Cohen (1988) defines .1 as small, .3 as moderate, and .5 as large.

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