

BEHAVIOURAL DIFFICULTIES AND THEIR IMPACT ON COGNITIVE, EMOTIONAL AND LEARNING ABILITIES

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Abstract

Behavioural difficulties during childhood and adolescence, particularly externalising symptoms such as aggression, impulsivity, and oppositional behaviour, can negatively affect academic achievement, emotional well-being, and social functioning. These difficulties are frequently associated with deficits in executive functions (EFs), including inhibitory control, working memory, and cognitive flexibility, as well as maladaptive academic emotions and reduced school engagement. Despite their relevance, few studies have examined these associations longitudinally using multi-informant designs. The present study investigated relationships between externalising behavioural difficulties, EFs, academic emotions, and school well-being in Italian students from 4th grade of primary to 8th grade of middle school (~700 participants; 53% female), at two time points. Students completed self-report questionnaires on behavioural difficulties, learning difficulties, academic emotions, and school well-being, alongside tasks assessing inhibitory control, working memory, and cognitive flexibility. Teachers and parents provided parallel evaluations of students' school well-being, and parents also completed evaluations of students' executive functioning. Correlations revealed that behavioural difficulties were significantly associated with lower school satisfaction, reduced self-efficacy, poorer teacher relationships, and higher negative academic emotions. T-tests confirmed that students with higher behavioural difficulties reported lower concentration, whereas no significant differences emerged for cognitive flexibility. GLM analyses of the BRIEF subscales indicated significant effects of behavioural difficulties on student-reported EFs, with parent-reported EFs confirming similar patterns. Regression analyses further showed that behavioural difficulties at T1 negatively predicted school satisfaction and self-efficacy at T2. These findings underscore the critical role of executive functioning and emotional regulation in explaining the impact of behavioural difficulties on school experiences. Results support early, targeted interventions aimed at enhancing executive functions and fostering adaptive academic emotions to improve students' learning, engagement, and well-being, particularly for students with behavioural difficulties.

Keywords: *Behavioural difficulties, executive functions, academic emotions, school well-being, longitudinal study.*

1. Introduction

Behavioural difficulties, especially externalising problems such as hyperactivity, aggression, and oppositional behaviour, represent a significant challenge for children's development and educational adjustment. These difficulties are linked to compromised academic performance, reduced emotional regulation skills, and lower social adaptation (Duncan & Magnuson, 2011). Their persistence may result in long-term disengagement from school and poorer learning trajectories.

From a cognitive perspective, externalizing symptoms are often associated with deficits in executive functions (EFs), including inhibition, working memory, and cognitive flexibility, that support intentional behaviour, self-regulation, and goal-directed action (Castro et al., 2020). Difficulties in these domains frequently contribute to impulsivity, emotional dysregulation, and trouble maintaining concentration during academic activities (Duncan & Magnuson, 2011).

Emotional processes play a crucial role in mediating the impact of behavioural difficulties on learning. According to Pekrun's (2006) Control-Value Theory of Achievement Emotions, students' emotions in school, such as anxiety, anger, and hopelessness, are key determinants of their engagement and motivation. Children with behavioural difficulties often experience heightened negative academic emotions

and reduced school satisfaction (Tobia, Gabriele, & Marzocchi, 2011). These emotional experiences may reinforce maladaptive behaviours and further impair learning. Developmental models suggest that cognitive and emotional systems interact dynamically to shape learning and adaptation (Blair & Raver, 2015). Executive functioning facilitates emotional regulation, supporting sustained attention, adaptive responses to challenges, and positive engagement. However, research employing longitudinal and multi-informant designs remains limited, especially within European school contexts.

2. Objectives

The study examined whether behavioural difficulties are associated with lower self-regulated learning abilities (concentration, flexibility), poorer executive functioning as measured by both rating scales and performance tasks, and lower school well-being and more negative academic emotions. Hypotheses were: (H1a) higher behavioural difficulties relate to lower concentration and flexibility; (H1b) behavioural difficulties associate with impaired EF and learning outcomes; (H2) behavioural difficulties at T1 predict lower school well-being and more negative emotions at T2.

3. Methods

3.1. Pilot study

A pilot study (N = 56) tested feasibility of administration and clarity of instruments; procedural refinements were made to streamline online questionnaire flow and schedule individual cognitive assessments in school settings.

3.2. Participants and sampling

Participants were recruited from several Italian primary and lower secondary schools; at T1 the sample comprised 653 students (47.3% female; mean age \approx 11.94 years) and at T2, after 5/6 months, 343 students. A subsample (\sim 30%) completed individual performance tasks. Schools participated via voluntary response; parental informed consent and institutional ethical approval were obtained.

3.3. Instruments

All students completed an online battery of questionnaires followed by sociodemographic questions and an anonymous personal code, while a subsample also participated in individual and group-based cognitive tasks. Behavioural difficulties were assessed with a single 5-point item, a method supported by evidence showing that self-reports reliably capture externalizing behaviours (Kormos & Gifford, 2014). Executive functions were measured through the BRIEF-2 (Gioia, Isquith, Guy, & Kenworthy, 2015), administered to students in the subsample, and their parents. The student form evaluates executive domains: the Behavioural Regulation Index (BRI), Emotional Regulation Index (ERI), Cognitive Regulation Index (CRI), and Global Executive Composite (GEC) indices ($\alpha=.91$), while the parent form includes additional scales such as Initiate and Organization of Materials ($\alpha=.92$).

Study strategies and self-regulation processes were assessed through the flexibility and concentration subscales of the AMOS 8–15 battery, a 14-item tool exploring students' study approaches (Cornoldi, De Beni, Zamperlin, & Meneghetti, 2005). Students' perceived learning difficulties were captured through six items addressing reading, comprehension, memory, writing, mathematics, and foreign languages, combined into a reliable scale ($\alpha=.77$). School well-being was evaluated using the QBS 8–18 (Marzocchi & Tobia, 2011), a 27-item self-report including subscales such as Satisfaction/Recognition, Teacher and Peer Relationships, Emotional Attitude, and Self-Efficacy ($\alpha=.62-.81$; total $\alpha=.82$). Academic emotions were assessed via the AEAL (Raccanello, Brondino, Crescentini, Castelli, & Calvo, 2022), which measures positive and negative emotions through 10 adjectives rated on a 5-point scale ($\alpha=.66-.82$).

Students in the subsample also completed standardised cognitive tasks: cognitive flexibility was measured with the Dimensional Change Card Sort (Zelazo, 2006); working memory with the Letter-Number Sequencing task of the WISC-IV (Wechsler, 1991; Orsini, Pezzuti, & Picone, 2012); inhibitory control with the child-friendly Flanker task using cartoon fish (Rueda et al., 2004); and planning with the Tower of London task (Phillips, 1999). Learning abilities were further assessed through standardised reading and writing tests from the DDE-2 battery (Sartori, Job, & Tressoldi, 2007), rapid calculation tasks from the BDE-2 (Biancardi & Nicoletti, 2015), and a descriptive writing task from the BVSCO-3 (Cornoldi, De Beni, Zamperlin, & Meneghetti, 2005).

3.4. Statistical analysis

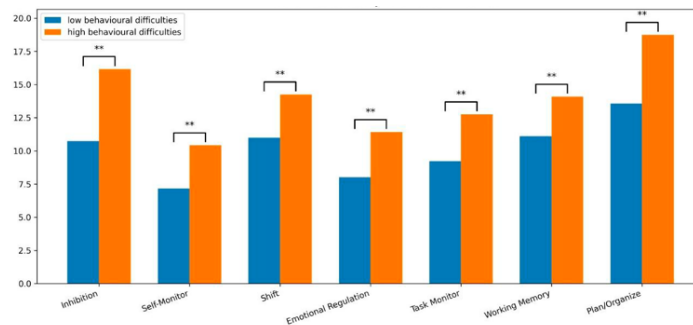
Analyses used SPSS and Mplus: descriptive statistics, Pearson correlations, independent samples t-tests, GLMs and multivariate regression and path models predicting T2 outcomes from T1 variables while

controlling for baseline scores. Psychometric checks (Cronbach's alpha) ensured acceptable reliability; models' fit was evaluated with RMSEA, CFI and TLI.

4. Results

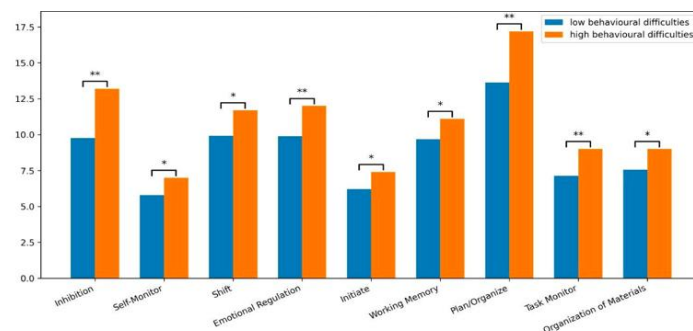
Analyses revealed that students with higher behavioural difficulties reported significant impairments in everyday executive functioning, particularly in inhibition, self-monitoring, working memory, and planning abilities. GLM analyses of BRIEF-2 student scores showed significant group differences, with the strongest effects for inhibition, followed by self-monitoring, planning and organization, and emotional regulation. Smaller yet significant effects were observed for cognitive flexibility and working memory (Figure 1).

Figure 1. Brief-Student Subscale Scores by Behavioural Difficulties (GLM) - Note: * = $p < .05$; ** = $p < .01$.



BRIEF-2 parent scores mirrored these findings, indicating that parents also perceived greater executive functioning difficulties in children with elevated behavioural problems, especially in inhibition, emotional regulation, planning, and task monitoring (Figure 2). Behavioural difficulties were moderately negatively correlated with school satisfaction, self-efficacy, and teacher relationships, and positively correlated with negative academic emotions such as anger, hopelessness, and boredom. Comparisons between students with low versus moderate-to-high behavioural difficulties indicated that those with elevated difficulties reported lower concentration and greater perceived learning difficulties in reading and writing, whereas rapid calculation performance did not differ. Performance-based cognitive tasks did not consistently distinguish behavioural groups, whereas BRIEF-2 ratings showed robust associations across inhibition, self-monitoring, planning/organization, and emotional regulation.

Figure 2. Brief-Parents Subscale Scores by Behavioural Difficulties (GLM) - Note: * = $p < .05$; ** = $p < .01$.



As illustrated in Figure 3, behavioural difficulties negatively predicted students' satisfaction ($\beta = -.23$) and self-efficacy ($\beta = -.19$), suggesting that higher behavioural issues are associated with lower levels of school well-being. In contrast, the total score of self-reported learning difficulties positively predicted all dimensions of well-being, except for Emotional Regulation. Pearson correlation analyses revealed significant associations between behavioural difficulties reported at T1 and several academic emotions measured at T2. Significant negative correlations were found with the emotions of pride ($r = -.30$, $p < .001$) and enjoyment ($r = -.17$, $p = .04$), while significant positive correlations were observed with feelings of anger ($r = .41$, $p < .001$), hopelessness ($r = .21$, $p = .01$), and boredom ($r = .26$, $p = .002$). These findings suggest that students perceived as exhibiting greater behavioural difficulties tend to report lower levels of positive self-related emotions and higher levels of negative school-related ones. Self-reported learning difficulties at T1 followed a similar pattern, showing significant negative correlations with feelings of enjoyment ($r = -.23$, $p = .006$) and pride ($r = -.21$, $p = .01$), and significant positive correlations with shame ($r = .27$, $p = .002$) and boredom ($r = .22$, $p = .01$).

Figure 3. Standardized Regression Model of Behavioural Difficulties and Learning on QBS Outcomes.

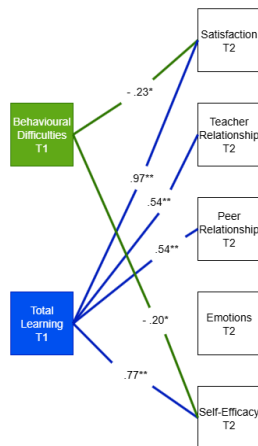
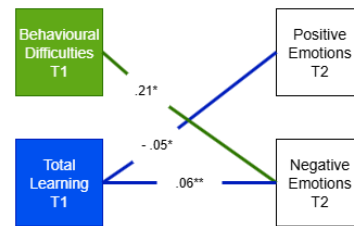


Figure 4. Standardized Regression Model of Behavioural Difficulties and Learning on AEAL Outcomes.



A regression analysis was conducted using behavioural difficulties and self-reported learning difficulties at T1 as predictors of academic emotions at T2, grouped into Positive and Negative Emotions. Model fit indices (RMSEA=0.00; CFI=1.00; TLI=1.00) indicated an excellent fit, suggesting that the proposed model closely reproduces the observed data. Figure 4 shows that behavioural difficulties significantly predict negative emotions, whereas perceived learning difficulties significantly predicted both lower levels of positive emotions and higher levels of negative emotions. These results suggest that both behavioural and learning challenges contribute to students' emotional experiences at school, with learning difficulties impacting both poles of the emotional spectrum.

5. Discussion

The present study examined the interplay between behavioural difficulties and multiple domains of students' functioning in school using a longitudinal, multi-informant design. Drawing on prior evidence that behavioural regulation influences learning, engagement, and adjustment (Romero-López, Quesada-Conde, Bernardo, & Justicia-Arráez, 2017), the study addressed three objectives: (H1a) whether higher behavioural difficulties were associated with reduced concentration and flexibility; (H1b) whether behavioural difficulties related to impairments in learning outcomes and executive functioning as reported by students and parents; and (H2) whether T1 behavioural difficulties predicted school well-being and academic emotions at T2.

Findings showed that externalising behavioural difficulties had widespread effects on everyday executive functioning, emotional experiences, and school well-being. A discrepancy emerged between rating-based and performance-based EF measures, consistent with the distinction between typical (ecological) and maximal (test) performance: rating scales such as the BRIEF-2 reflect sustained, real-world regulatory demands not captured by brief, structured tasks (Toplak, West, & Stanovich, 2013). As a result, students may perform adequately under optimal conditions while continuing to struggle with self-regulation in daily classroom contexts. The strong concentration gap aligned with models identifying inhibitory control and working memory as central to classroom behaviour (Romero-López et al., 2017). Inhibitory control supports the suppression of impulsive behaviours and adherence to school norms, while working memory enables following instructions and maintaining task goals. When these skills are impaired, students show higher distractibility and difficulties sustaining attention (Romero-López et al., 2017). Conversely, cognitive flexibility, assessed via self-report, did not correlate with behavioural difficulties, likely because flexibility is less salient in everyday context (Hohl & Dolcos, 2024).

Consistent with learning-task results, behavioural difficulty levels were not differentiated by performance-based measures of inhibition, switching, planning, or working memory. In contrast, BRIEF-2 ratings showed strong differences across EF domains. Parental ratings confirmed students' reports, especially for inhibition, self-monitoring, planning/organisation, and emotional regulation, domains commonly associated with externalising behaviours. This pattern reflects the ecological nature of rating-based EF measures (Hendrickson & McCrimmon, 2019) and the limited ecological validity of performance tasks (Toplak et al., 2013). Overall, results support integrated school-based interventions combining behavioural supports, teacher coaching, scaffolded routines, EF-training programmes, and emotional-regulation approaches. Because rating-based EF measures partly mediated the link between

behavioural difficulties and school well-being, strengthening students' daily regulatory skills may enhance competence, emotional experiences, and overall satisfaction. Limitations include reliance on self-reports for some constructs, short interval between T1 and T2, and voluntary school participation, which may limit generalisability. Future research should use systematic classroom observations, longer follow-up periods, and randomised controlled studies.

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