



Executive Functions and Behavioral Problems in Students with Visual Impairments at Regular and Special Schools

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- ⇒ Research Background
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Research Background

- ⇒ **Behavioral problems** frequently occur in students with visual impairments (VI), at least temporarily
 - ⇒ **Stereotyped behaviors** (e.g., rocking; Fazzi et al., 1999; Gal & Dyck, 2009)
 - ⇒ High incidence of **internalizing problems** (Kammerer et al., 2003)
 - ⇒ **Emotional problems** and **peer problems** were significantly higher among adolescents with VI than among adolescents with normal vision (Pinquart & Pfeiffer, 2012)
- ⇒ Behavioral problems seem to be **less pronounced among students with VI at regular schools** (Maes & Grietens, 2004)

- ⇒ **Executive functions** are regulatory and control mechanisms that are essential for performing goal-oriented and situation-related actions (e.g., Miyake et al., 2000)
 - ↪ Initiate problem-solving processes
 - ↪ Inhibit the effect of distracting stimuli or actions
 - ↪ Select relevant action goals
 - ↪ Organize complex problem-solving processes
 - ↪ Flexibly adjust problem-solving strategies
 - ↪ Monitor one's own course of action and evaluate its success
 - ↪ Working memory

Research Background

- ⇒ **Executive functions might be less well developed in students with VI**
 - ⇒ **Increased prevalence of regulatory disorders** in infants with VI aged 6 to 36 months (Alon et al., 2010)
 - ⇒ Preschool children with congenital VI show a **reduced capacity to regulate their attention** as compared to children with normal vision (Tadić, Pring & Dale, 2009)
 - ⇒ Students with VI use rather **global self-regulatory learning strategies** that do not adapt to the specific demands of distinct school subjects (Argyropoulos et al., 2012)
- ⇒ **Less well developed executive functions might contribute to behavioral problems** among students with VI

Research Questions

- (1) Are there any **differences in executive functioning between students with VI and a normative sample** of children with normal vision?
- (2) Do **students with VI at regular schools** differ in their executive functions from **students with VI at schools for the blind and visually impaired**?
- (3) Does **executive functioning predict behavioral problems** among students with VI?

Sample (N=226)

Variables	Characteristics	N	%
Gender	Male	121	53.5
	Female	105	46.5
Age (M = 12.0 SD = 3.5)	5 to 8 years	52	23.0
	9 to 13 years	104	46.0
	14 to 18 years	70	31.0
Citizenship	German	152	67.3
	Other citizenship	73	32.3
	Missing data	1	0.4
Degree of Visual Impairment	0,3 to 0,05	135	59.7
	0,05 to 0,02	51	22.6
	< 0,02	33	14.6
	Missing data	7	3.1
Additional Handicap	Yes	111	49.1
	No	109	48.2
	Missing data	6	2.6
Type of School	School for the Blind and Visually Impaired	136	60.2
	Regular School	90	39.8

Sample (N=226)

⇒ Significantly more **students with additional handicaps** at schools for the blind and visually impaired
 ($\chi^2 = 43.12$, $df = 1$, $p < .001$)

N (%)	Students with VI at Special Schools (n = 136)	Students with VI at Regular Schools (n = 90)
Without Additional Handicaps	41 (30%)	68 (76%)
With Additional Handicaps	90 (66%)	21 (23%)
Missing Data	5 (4%)	1 (1%)

⇒ All information is based on teachers' ratings

⇒ Executive Function

- ⇒ ***Behavior Rating Inventory of Executive Function BRIEF***
(Gioia, Isquith, Guy, & Kenworthy, 2000)
- ⇒ 73 items (e.g., “has explosive, angry outbursts”; “does not check work for mistakes”), 8 subscales
- ⇒ *Behavior Regulation Index BRI* (cumulative value of the “Inhibition”, “Shift”, and “Emotional Control” subscales)
- ⇒ *Metacognition Index MI* (cumulative value of the “Initiate”, “Working Memory”, “Plan/Organize”, “Organization of Materials”, and “Monitor” subscales)
- ⇒ *Global Executive Composite GEC*

⇒ Behavioral Problems

- ⇒ ***Strengths and Difficulties Questionnaire SDQ-D***
(Rothenberger & Woerner, 2004)
- ⇒ 25 items (e.g. “constantly fidgeting or squirming”; “considerate of other people’s feelings”; etc.)
- ⇒ ***Total Difficulties Score:*** Emotional Problems, Conduct Problems, Hyperactivity, Peer Problems

⇒ Additional Data

- ↪ **Sociodemographic variables** (gender, age, citizenship, type of school)
- ↪ **Variables related to impairment** (degree of visual impairment, additional handicaps)
- ↪ **Communicative Competence Scale** (Hintermair, 2013)
consisting of 4 items (e.g., “The child is able to understand the things I/people want to tell or explain to him/her.”)

Results

Scale	(1) Students with normal vision from normative sample (N = 720)		(2) Students with VI at regular schools (N = 90)		(3) Students with VI at special schools (N = 136)		F	ES	Sign. Diff.
	M	SD	M	SD	M	SD			
Inhibit	12.5	4.0	14.1	5.0	16.9	5.8	58.86***	.75	1 < 2 < 3
Shift	11.9	3.0	15.5	4.1	17.7	5.0	184.26***	1.42	1 < 2 < 3
Emotional Control	10.7	3.1	12.2	4.5	14.7	5.7	68.09***	.81	1 < 2 < 3
Initiate	9.4	3.0	11.9	3.6	13.3	3.8	99.87***	1.05	1 < 2 < 3
Working Memory	12.9	3.9	16.2	5.5	18.2	5.6	97.81***	1.03	1 < 2 < 3
Plan/Organize	13.1	3.9	15.9	4.5	17.7	4.9	81.71***	.94	1 < 2 < 3
Organization of Materials	8.5	2.6	10.4	3.5	11.7	4.5	72.16***	.88	1 < 2 < 3
Monitor	13.4	3.7	16.4	4.9	18.9	5.4	113.41***	1.10	1 < 2 < 3
Behavior Regulation Index BRI	35.0	9.0	41.8	11.2	49.3	14.1	122.78***	1.12	1 < 2 < 3
Metacognition Index MI	57.4	15.4	70.8	19.0	79.8	20.5	118.67***	1.13	1 < 2 < 3
GEC (BRI + MI)	92.5	22.6	112.6	26.1	129.1	31.5	142.55***	1.23	1 < 2 < 3

Note. ***p < .001. GEC = Global Executive Composite. Higher scores indicate lower functioning.

⇒ **Differences to normative sample remain significant** when students with VI and additional handicaps are excluded from the analysis, but **within-group differences disappear**: 1 < (2 = 3)

Results

Predictor variables	SDQ Total Difficulties Score	
	β	t score
Gender	-.18	-4.11 ^{***}
Age	-.19	-4.00 ^{***}
Citizenship	.02	.50
Degree of Visual Impairment	.004	-.09
Additional Handicap	.03	.51
Type of School	-.02	-.40
Communicative Competence	-.09	-1.85 ^T
BRIEF Behavior Regulation Index	.63	10.30 ^{***}
BRIEF Metacognition Index	.21	3.55 ^{***}
		R = .80; R ² = .64; adj. R ² = .62

Note. *** p < .001; ^T p < .10

⇒ Research questions (1) and (2)

- ↪ **Highly significant differences** in all domains of executive functioning **to the disadvantage of students with VI**
- ↪ **Considerable within-group differences**, in that students with VI at regular schools showed better executive functions than those at special schools
- ↪ **Within-group differences disappeared** when students with additional handicaps were removed from the analysis
- ↪ **Students with VI and additional handicaps were overrepresented at special schools** (66% vs. 23% at regular schools)
- ➔ **Within-group differences might be due to overrepresentation**

⇒ Research question (3)

- ⇒ In addition to age, gender, metacognitive abilities, and in a tendency communicative competence, **the executive aspect of behavior regulation is particularly significant**
- ⇒ **Similar results** in studies on **students with hearing impairments** (Hintermair, 2013) and on **students with intellectual disabilities** (Janz et al., 2012)

⇒ Limitations

- ↪ **Cross-sectional data**
- ↪ **Teacher reports**, not data from observing or surveying the children themselves
- ↪ **Cross-cultural comparison** of German and US data
- ↪ Some **items might not indicate executive or behavioral problems among students with VI** (e.g., BRIEF: “Cannot find things in room or school desk”, SDQ: “Nervous in new situations, easily loses confidence”)
- ↪ **However**, the results of the present study show an **increased occurrence** of these behaviors, and thus **a specific need for support among students with VI**

⇒ Implications for practitioners

- ⇒ A wide range of **executive functions** significant for socio-emotional development are **not sufficiently developed** in many students with VI
- ⇒ Behavior regulation issues and metacognition problems among students with VI will **require increased attention to ensure social and academic success**, especially **in the context of inclusion**
- ⇒ Need to **strengthen competencies** that are attributed to executive functions (e.g., impulse control, emotional understanding, shifting)
- ⇒ **Intervention programs** focusing on executive functions among children with normal vision **might be adapted** to the needs of children with VI (e.g., Bodrova & Leong, 2007; Diamond, Barnett, Thomas & Munro, 2007)
- ⇒ Educational support programs should **take executive functions into account as early as possible**, since major developmental challenges for children with VI emerge in the first years of life (e.g., Brambring, 2005)



Thank you for your attention!

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