



42nd Annual IARLD Conference for Research in Learning Disabilities (IARLD)

Programme

1st July 2018 Pre-Conference Activities

2-3 July 2018 Conference

Artevelde University College, campus Kantienberg

Gent

Belgium



Artevelde University College



Contact

Voetweg 66
9000 Ghent

☎ 09 234 70 00

Location and accessibility

Campus Kantienberg is located right in the centre of the student district. From Ghent-Sint-Pieters station it's a 20-minute walk to the campus. Take the Koningin Astridlaan. Continue through the Citadelpark and Kunstlaan. At the end of Kunstlaan you will arrive at Voetweg.

By bike you can even get there in 10 minutes. The campus has a covered bike parking.

Public transport

From Ghent-Sint-Pieters station: take bus 34, 35, 36, 55, 57, 58, 70, 71, 72 or 77 to the stop 'Heuvelpoort'. Continue on foot through Overpoortstraat, Stalhof and Benedictijnenstraat to the campus in the Voetweg.

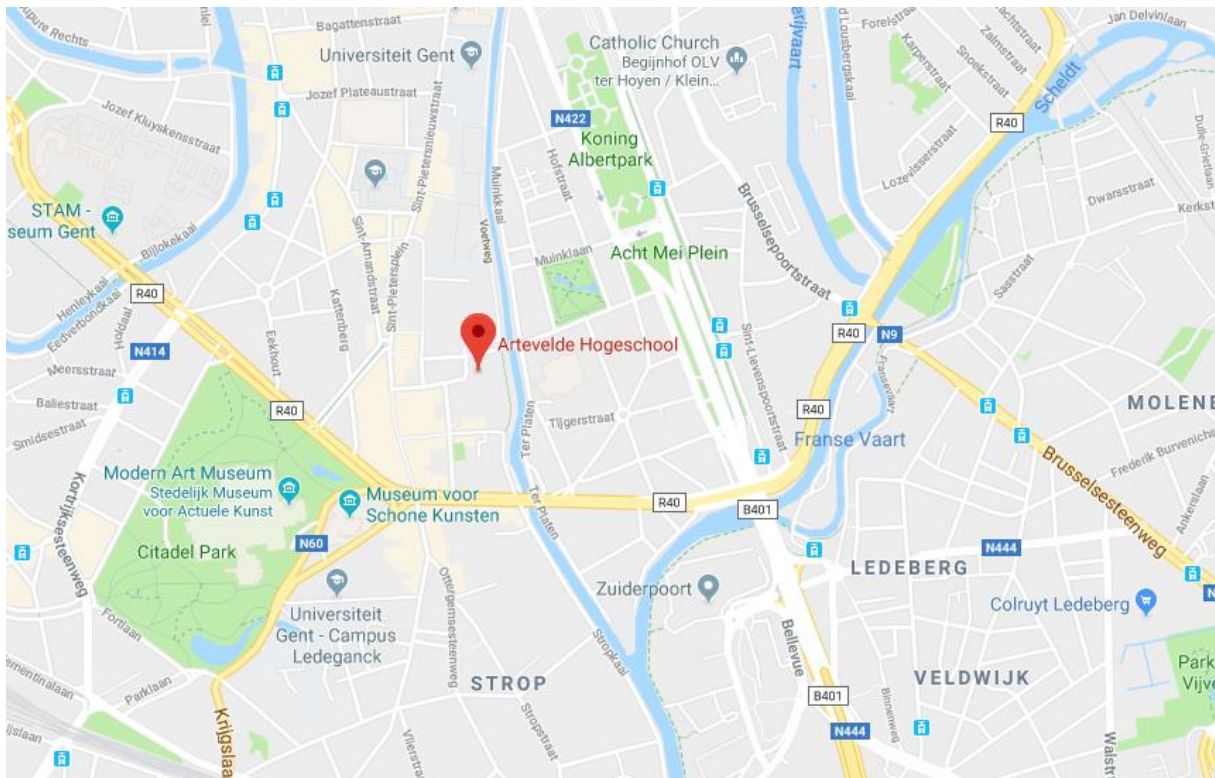
From Ghent-Dampoort station: take bus 34, 35, 70, 71, 72, 77 or 78 to the stop 'Heuvelpoort'. Continue on foot through Overpoortstraat, Stalhof and Benedictijnenstraat to the campus in the Voetweg.

By car

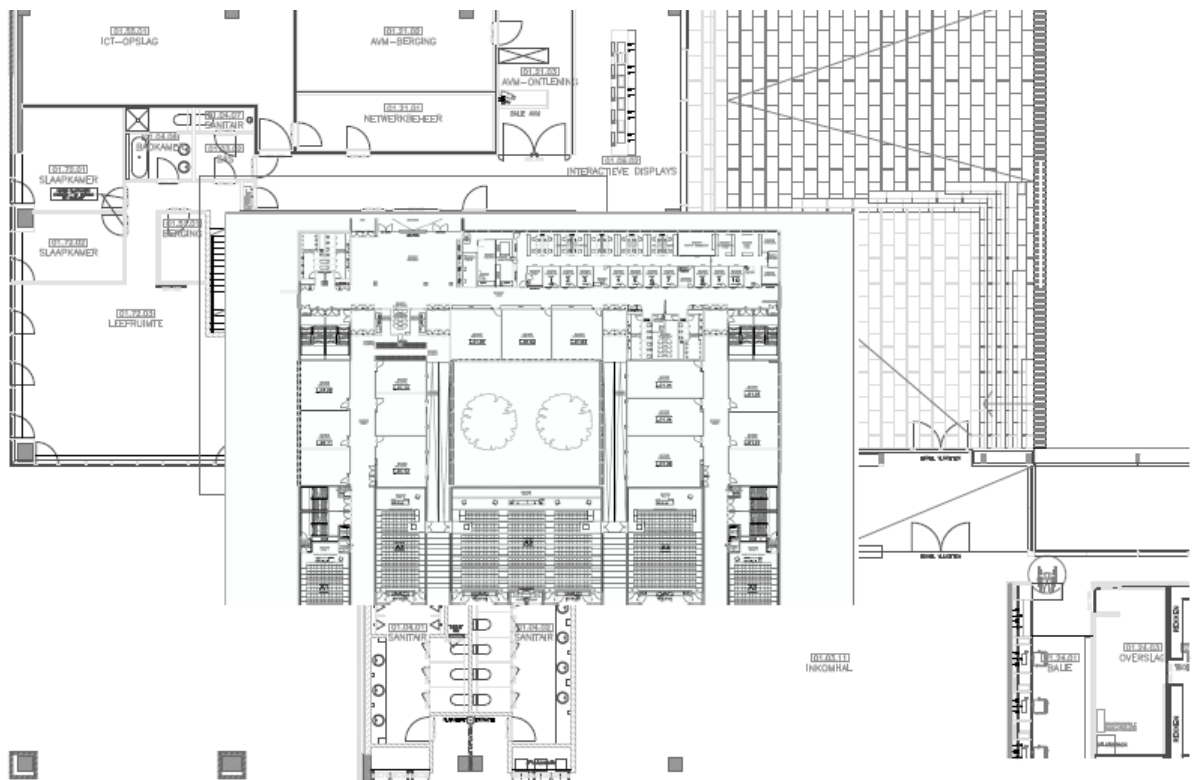
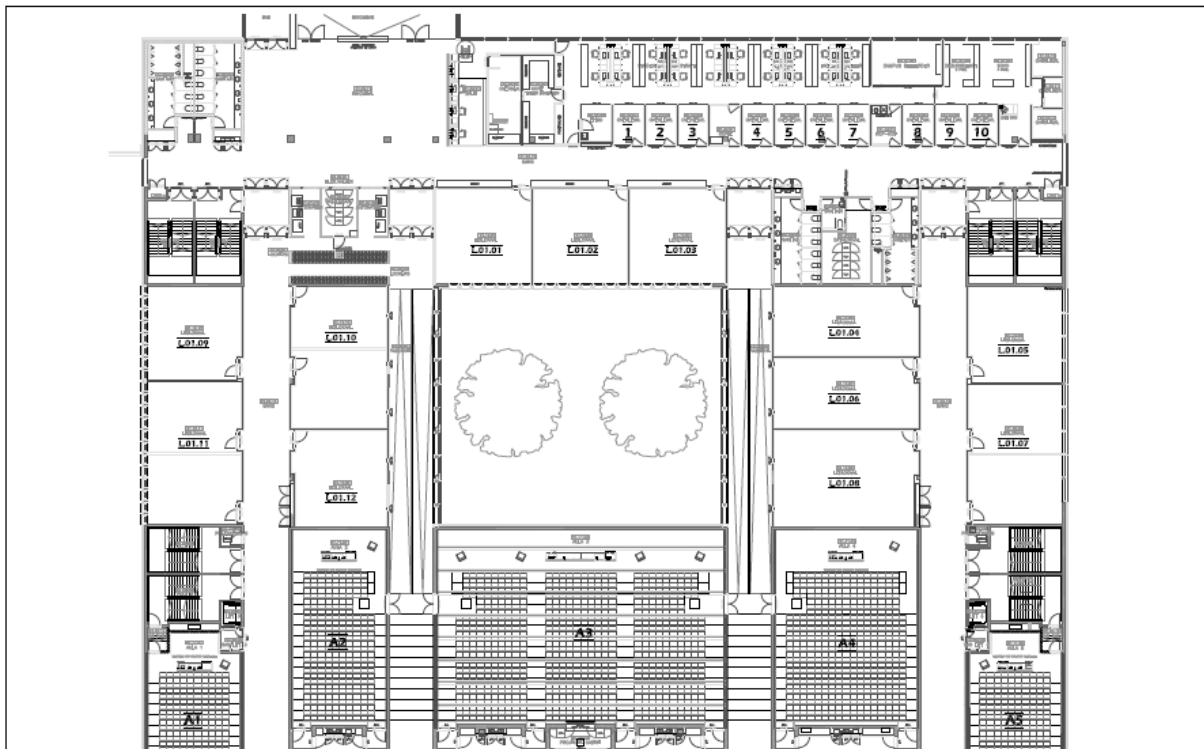
If you come to campus Kantienberg by car you can park under the Sint-Pietersplein.

- Student restaurant and cafeteria
- Media library
- Courtyard
- Covered bike park

Maps



Showing access/entry to the campus, Kantienberg/Voetweg 66



Welcome from the Conference Hosts

The Organizing Committee of the 42nd Annual International Academy for Research in Learning Disabilities Conference would like to warmly welcome you to the Artevelde University College (member of the Ghent University Association) in Ghent, Belgium.

It is the third time Belgium welcomes IARLD. In 1983 IARLD was held in Brussels (with as chair Marianne Kees and keynote speaker Barbare Keogh). In 2001 IARLD was held in Antwerp in conjunction with the Netherlands and Belgian Congress on Dyslexia and Dyscalculia and the European Congress on Learning Disabilities. (with as co-chairs Wied Ruijsenaars and Pol Ghesquiere and as William M. Cruickshank Memorial Lecturer Doris Johnson).

We are delighted to be able to host this conference in 2018 at the Artevelde University College. The Artevelde University college has 11 campuses, 18 bachelor programmes, 5 advanced bachelor programmes, 6 international semester programmes, almost 14000 students and more than 1300 employees in Gent. We welcome you at our campus in Kantienberg. Artevelde university college has 850 partner institutions around the world.

The Conference organizing Committee of this conference included Professor Dr. Annemie Desoete (Ghent University and Artevelde University College), Professor Dr. Pol Ghesquière (University of Leuven), Dr. Petra Warreyn (Ghent University), Elke Baten (Ghent University), Nele Schuddinck (Artevelde University college), Ruth Vanderswalmen (Artevelde University College) and Christel Van Vreckem (Artevelde University college). Professor Annemie Desoete is a Fellow of the International Academy for Research in Learning Disabilities (IARLD) and chair of the Organizing Committee of this conference.

The IARLD Conference is held each year and at this 42nd IARLD Conference participants have travelled far to be here. We are delighted that this year we will be able to introduce you to the finest researchers in learning sciences and learning difficulties all over the world. In particular we are honored that professor Linda Siegel will present the William M. Cruickshank Memorial Lecture with the inspiring title of ‘Solving the Problem of Learning Disabilities’.

We trust that you will enjoy participating in the conference. We encourage you to actively join in the discussions that are such an important feature of our conferences. We hope that alongside your learning and development of new understandings that you will enjoy the company of your colleagues in the field of learning difficulties and learning disabilities, and renew friendships and make new ones.

Again we welcome you all.

With kind regards

The Organizing Committee – Annemie Desoete, Pol Ghesquière, Petra Warreyn, Nele Schuddinck, Ruth Vanderswalmen and Christel Van Vreckem.

Thank you

Thank you to the Committee of Reviewers who reviewed the Abstract for the conference:

Stephanie Al Otaiba, Pol Ghesquière, Georgios Sideridis, Lee Swanson, Christa Van Kraayenoord, Petra Warreyn and Annemie Desoete

Thank you to Lynn Meltzer and to the IARLD office for the practical assistance organizing this conference.

The Organizing Committee of the 42nd IARLD Conference wishes also to thank ‘Netwerk Leerproblemen Vlaanderen’ for the support in providing funding for the conference.

Accessing Wi-Fi on Campus

Select Wi-Fi on your device

SSID (name): iarld2018
Password: Welcome@iarld2018!

42nd Annual IARLD Conference Programme

Sunday 1st July 2018

Pre-Conference Schedule:

12:45 - 15:00	Sight Seeing Trip
15:30 - 18:30	IARLD Executive Board Meeting - 10 th floor
18:30 - 21:00	Executive Board Dinner - De Graslei - Graslei 7 - Gent

Monday 2nd July 2018

Conference Day 1 Schedule

8:15 – 8.45	Registration and Continental Breakfast - Entrance hall and winter garden/wintertuin, cloakroom L01.01
8:45- 9:15	Welcome from Annual Conference Chair and IARLD President – A 4
9:15 – 10:45	Symposium 1 – A4 Predicting Resilience: Self-Regulation and Self-Efficacy Michal Al-Yagon, Adi Sharabi, Malka Margalit, Adi Mana, and David Scanlon (Discussant)
10:45- 11:15	Break - Winter garden/Wintertuin
11:15 – 13:00	Symposium 2 – A 4 Non-cognitive Predictors of Math Achievement Lars Orbach, Elke Baten, Karin Kucian, and Delphine Sasanguie (discussant)
13:00- 14:00	Lunch - Winter garden/Wintertuin
14:00-15:30	Symposium 3 – A4 Research on Learning Difficulties, Chaos in need for Organization? The importance of Participant Selection Criteria, Categorization and longitudinal Designs

	Kiran Vanbinst, Elien Bellon, Jolijn Vanderauwera, and Pol Ghesquière (discussant)
15:30-17:30	Poster Sessions - Wine & Cheese Reception and the Janette Klinger IARLD Conference Poster Award - 10th floor
19:15 - 21:45	IARLD Conference Banquet Dinner - 't Pand Onderbergen 1 Gent

Tuesday 3rd July 2018

Conference Day 2 Schedule

8:15 – 8:45	Registration and Continental Breakfast – Winter garden/Wintertuin
8:45 – 9:00	Conference Announcements – A 4
9:00 - 10:30	Symposium 4 – A4 Emotional factors in Specific Learning Disorders and Difficulties Irene C. Mammarella, Julia M. Carroll, Mika Paananen, David Giofrè, and Ann Dowker (Discussant)
10:30 - 11:00	Break – winter garden/wintertuin
11:00 - 12:30	Symposium 5 – A 4 Spelling in different Languages: do we speak and write the same Language? Tessa Daffern, Wim Tops, Christel Van Vreckem, and Annemie Desoete (Discussant)
12:30-13:30	Lunch – Winter garden/Wintertuin
13:30 – 14:40	Round Table Discussions 1. Executive Function across Age-Levels and Contexts: Impact on Academic Performance in Different Cultural Groups Lynn Meltzer, Linda Mason, Julie Dunstan-Brewer, and Yveta Kovilcikova Room L.01.04 2. Towards an International Understanding of Learning Disabilities: How are Learning Disabilities Defined and Operationalized in Your Country / Culture? Michael Grosche, Matthias Grünke, David Scanlon, and Georgios Sideridis Room L.01.05

3. Learning Disabilities in Adolescents and Adults. How to assess and handle?

Petra Warreyn, Ellen Meersschaert, Celestino Rodriguez, Tal Erez-Hod, Tal Rand Koltin

Room L.01.06

4. The Importance of Spelling across Languages

Tessa Daffern, Beatriz Vargas Dorneles, Kerstin Nobel, Matthias Grünke and Irit Bar-Kochva

Room L.01.07

14:40 – 15:40

William M. Cruickshank Memorial Lecture –A 4

Solving the Problem of Learning Disabilities

Professor Linda Siegel

15:40 – 15:55

Break – Winter garden/Wintertuin

15:55 - 17:25

Symposium 6 – A 4

Development of Arithmetical skills and the Predictors of this Development

Antje Ehlert, Annemarie Fritz, Miriam Balt, Marc Brysbaert, and Christa Van Kraayenoord (Discussant)

17:25 - 18:00

Think Tank/Business Meeting - 10th floor

William M. Cruickshank Memorial Lecture

Solving the Problem of Learning Disabilities

Professor Linda Siegel

Abstract

Learning disabilities create serious social problems for our society, including homelessness, anti-social behaviour, mental health issues, and sometimes even suicide. We know how to solve many of the problems associated with learning disabilities. Early identification and intervention, streamlining assessment, providing good reading, writing and mathematics instruction, evidence based interventions, improved teacher training, help for the emotional consequences of learning disabilities are all solutions to the problems. We know how to do all these and I will provide evidence for these solutions. We need to turn our efforts toward making them a reality.

Biography

Prof. Linda Siegel is the former Dorothy C. Lam Chair in Special Education and an Emeritus Professor in the Department of Educational and Counselling Psychology and Special Education at the University of British Columbia, Vancouver, Canada.

She has over 200 publications on early identification and intervention to prevent reading problems, dyslexia, reading and language development, mathematical concept learning, mathematical learning disabilities, and children learning English as a second language.

She has been the President of the Division of Learning Disabilities of the Council on Exceptional Children. In 2004, she was awarded an honorary doctorate from Goteborg University in Sweden. In 2010, she was awarded the Gold Medal for Excellence in Psychological Research from the Canadian Psychological Association. In 2012 she was awarded the Eminent Researcher Award from the Learning Difficulties Association of Australia.

She has recently published a book entitled *Not Stupid, Not Lazy: Understanding Dyslexia and Other Learning Disabilities*. This book is published by the International Dyslexia Association.

SYMPOSIA

1. Predicting Resilience: Self-Regulation and Self-Efficacy

Participants

Michal Al-Yagon, Department of School Counseling and Special Education, Constantiner School of Education Tel-Aviv University, Israel.

Adi Sharabi, Kibbutzim College of Education Technology & The Arts, Tel Aviv, Israel.

Malka Margalit, School of Behavioural Sciences, Peres Academic Center and Constantiner School of Education Tel Aviv University, Israel.

Discussant: David Scanlon

Abstract

This symposium presents three studies focusing on key dimensions of self-regulation as contributing to resilience and adjustment in youngsters with SLD and/or ADHD, compared to typically developing peers. In adolescents with SLD, Adi Sharabi investigated family climate, sense of coherence, and loneliness perceptions as contributing to general and specifically academic self-efficacy, while Malka Margalit and Adi Mana examined the mediating roles of test accommodations' implicit theories, family support, academic self-efficacy and hope in predicting academic achievements. Michal Al-Yagon explored four personal risk/protective factors in children with ADHD – the ADHD disorder, executive functioning, and secure attachments to father/mother – as explaining externalizing/internalizing behaviors, social skills, and negative emotions' regulation. Altogether, we addressed core resilience issues at different ecological levels: *individual* (academic self-efficacy, loneliness, executive functioning, child-parent attachment); *family* (climate); and *educational setting* (school-belonging).

Symposium's importance: Possible contributors to resilience and adjustment in youngsters with SLD/ADHD are of particular interest during these developmental periods, when trajectories are established that can lead to future difficulties in adulthood.

The role of family climate, sense of coherence and loneliness in predicting general and academic self-efficacy among adolescents with SLD

Adi Sharabi

Kibbutzim College of Education Technology & The Arts, Tel Aviv, Israel.

Objectives

Students with specific learning disorder (SLD) often express low levels of academic and general self-efficacy (Baird, Scott, Dearing, & Hamill, 2009; Hen & Goroshit, 2014; Idan & Margalit, 2014), which are related to personal and systemic variables (Karmvir, 2015; Lackaye & Margalit, 2006; Sharabi, Sade, & Margalit, 2016). This study aimed to identify the systemic (family climate), personal strength (sense of coherence [SOC]) and vulnerability (loneliness) variables in predicting students' general (SE) and academic self-efficacy (ASE). This study demonstrates the value of familial and personal resources in predicting students with SLD's SE and ASE, and explores the relation between vulnerability factor and students' SE and ASE. Recognizing personal and systemic strength and vulnerability is important in explaining resilience and adjustment among those with SLD. It is also important as strength can mediate the impact of students' lower SE and ASE.

Methods

The sample included 200 junior-high school students (ages 15-16 years, grades 9) in urban areas of central Israel: 57 with SLD (32 boys, 25 girls) and 143 without SLD (76 boys, 66 girls).

The following instruments were used: Adolescents' Self-Report Instruments; Self-efficacy (Chen, Gully, & Eden, 2001); Academic self-efficacy (Zimmerman, Bandura, & Martinez-pons, 1992); Family climate (FACES – Olson, 1987); Children's Sense of Coherence (Antonovsky, 1987); Loneliness (De Jong Gierve SLD & Van Tilburg, 2006).

Results

Group Differences

One-way ANOVAs were conducted with group (SLD/non-SLD) as the independent variable, and with SE, ASE, family cohesion, family adaptability, SOC, and loneliness as the dependent variables. Results revealed significant differences for SE ($F(1, 199) = 6.03, p < .05$, partial $\eta^2 = .030$); ASE ($F(1, 199) = 11.052, p < .01$, partial $\eta^2 = .053$), and loneliness ($F(1, 199) = 4.179, p < .05$, partial $\eta^2 = .021$). No significant differences were found for the other variables.

Findings revealed significant differences between the SLD and non-SLD groups. Students with SLD expressed lower SE ($M = 3.05; SD = 0.49$) than students without SLD ($M = 3.24; SD = 0.48$); lower ASE ($M = 4.13; SD = 1.16$) than students without SLD ($M = 4.74; SD = 1.16$); and, greater loneliness ($M = 1.66; SD = 0.54$) than students without SLD ($M = 1.51; SD = 0.45$).

Prediction of self-efficacy and academic self-efficacy

To examine the variables predicting adolescents' SE and ASE, two hierarchical multiple regression analyses were conducted for both adolescents with and without SLD, with self-reported SE and ASE as the dependent variables.

Self-efficacy

To control for sex and SLD, they were entered in the first step, explaining 4% of the variance.

Table 1

Hierarchical Multiple Regressions Predicting Self-Efficacy and Academic Self-Efficacy

Step	Variables	<i>Self-Efficacy</i>				<i>Academic Self-Efficacy</i>			
		<i>R</i>	<i>R</i> ²	<i>Beta</i>	<i>F</i>	<i>R</i>	<i>R</i> ²	<i>Beta</i>	<i>F</i>
1	Sex SLD	.20	.04	-.09 -.18*	3.95*	.24	.06	.11 -.17**	5.82**
2	Sex SLD Family cohesion Family adaptability	.44	.19	-.13 -.13* .25*** .10	11.77***	.43	.19	.03 -.19** .34*** .06	85.01***
3	Sex SLD Family cohesion Family adaptability Coherence Loneliness	.56	.31	-.02 -.89 .18* .14* .29*** -.16*	14.55***	.28 .53	.11 .26*** .10 .37*** .12	44.94***	

* $p < .05$; ** $p < .01$; *** $p < .001$.

At this stage, SLD status was a significant predictor. As seen in Table 1, the family cohesion and family adaptability measures were entered in the second step, adding 15% to the variance. At this stage the contribution of SLD status and family cohesion were significant. The SOC and loneliness variables were entered in the third step, adding 12%, thus reaching a total explanation of 31% of the variance. At this stage family cohesion, family adaptability, SOC, and loneliness were significant.

Academic Self-efficacy

As seen in Table 1, after controlling for sex and SLD status both explaining 6% of the variance, at this stage, SLD status was a significant predictor. The family measures were entered in the second step, adding 16% to the explanation of the variance; SLD status and family cohesion were significant. In the third step, SOC and loneliness were entered, adding 7%, thus reaching a total explanation of 28% of the variance. At this stage, SLD status, family cohesion, and SOC were significant.

Discussion and Conclusion

In sum, results showed that students with SLD reported lower levels of general SE and ASE and higher levels of loneliness. Their SE was positively related to their family climate (family cohesion and family adaptability), SOC, and negatively related to their loneliness. Analyses indicated the unique contribution of SLD status in predicting both general SE and ASE. Family cohesion and SOC contributed to both SE and ASE, while family adaptability and loneliness predicted only students' general SE.

The findings from the study present the challenges of students with SLD at school, displaying lower levels of personal resources as SE and ASE and higher levels of social

distress and loneliness than their peers. It also pinpoints the unique contribution of the family system and SOC in predicting high levels of SE and ASE, as loneliness had a unique and negative contribution in predicting only SE. Educational implications in terms of individual and familial counseling to empower children and families will be presented.

Executive Functions and Attachment Relationships in Children with ADHD: Links to Externalizing/Internalizing Problems, Social Skills, and Negative Mood Regulation

Michal Al-Yagon

Department of School Counseling and Special Education, Constantiner School of Education
Tel-Aviv University, Israel.

Considering that theoretical models of attention deficit hyperactivity disorder (ADHD) suggest multiple underlying pathways (Nigg, 2013) and that the co-occurrence of multiple risk factors may powerfully impair affective, interpersonal, and behavioural adjustment (e.g., Trentacosta et al., 2008), this study focused on several possible risk and protective factors in children with ADHD. Thus, the present study addressed three major objectives, investigating: (a) group differences among children with ADHD versus children with typical development (TD) in their prevalence of executive functioning (EF) capacities; (b) group differences (ADHD vs. TD) in the prevalence of children's secure attachment relationships with fathers and with mothers; and (c) the contribution of four personal risk and protective factors (TD vs. ADHD, secure vs. insecure child-father and child-mother attachments, and higher vs. lower EF capacities) in explaining children's better social skills, low level of externalizing/internalizing behavior, and regulation of negative emotions.

The present study offers preliminary findings on the possible role played by EF and by patterns of attachment with fathers/mothers, for children with ADHD. The findings, especially when validated by further research, hold significant implications highlighting the possible protective role of children's secure relationships with their fathers and mothers and, partially, their EF – in explaining their healthier socioemotional/behavioural adjustment measures. The EF capacities contributed only to intrapersonal adjustment, providing a new perspective on the non-academic functioning that may accompany ADHD.

Method

Participants were 100 Israeli Hebrew-speaking children (49 boys, 51 girls) ages 11-12 years ($M = 11.45$, $SD = .50$; 56 fifth graders, 46 sixth graders), comprising 50 children with formally diagnosed ADHD and 50 children with TD attending three public urban schools serving similar demographic neighborhoods.

The following five self-reports for children and one teacher report were used. The *Attachment Security Style* (Kerns, Klepac, & Cole, 1996) was administered twice, once about mothers and once about fathers. In addition the *Social Skills Improvement System—Rating Scales* version for children ages 8-12 (Gresham & Elliott, 2008), *Negative Mood Regulation* (Catanzaro & Mearns, 1990) and the Externalizing and internalizing syndrome scales from standardized *Youth Self-Report—Version Age 11-18* (Achenbach & Dumenci, 2001) were used. In addition as teacher report the *Behavior Rating Inventory of Executive Function* (BRIEF, Gioia, Isquith, Guy, & Kenworthy, 2000) was used.

Results

Significant group differences (ADHD vs. TD) emerged on: all EF measures, $F(8,91) = 17.96$, $p < .001$, $\eta^2 = .612$, both attachment relationships (with fathers and with mothers), $F(6,93) = 3.70$, $p = .002$, $\eta^2 = .19$, and most socioemotional/behavioural adjustment measures, $F(4,95) = 4.30$, $p = .003$, $\eta^2 = .15$. Thus, the present study underscored that, compared to a matched sample of elementary-school classmates with TD, children with ADHD reported significantly larger deficits in EF and a significantly lower incidence of secure attachment to the father, as well as

a lower sense of trust and closeness to the mother. Children with ADHD also reported significantly more externalizing problems, lower social skills, and poorer negative emotional regulation than children with TD, but no group difference emerged for internalizing behaviors.

Furthermore, results from the four linear regression analyses demonstrated all four risk/protective factors' significant contribution to explaining socioemotional/behavioural adjustment: children's ADHD, two parental attachments, and, partially, EF, which contributed only to intrapersonal maladjustment (see Table 1).

Table 1. *Regression Analyses*

Risk/Protective Factors	Socioemotional and behavioural adjustment measures							
	Externalizing behavior problems		Internalizing behavior problems		Social skills		Negative mood regulation	
	ΔR^2	B	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.13***		.02		.11***		.08**	
Children's ADHD		.36***		.14		-.32***		-.28**
Step 2	.24***		.12**		.32***		.27**	
Children's ADHD		.26**		.04		-.18*		-.14
Child-mother attachment		-.23*		-.12		.28**		.25**
Child-father attachment		-.20*		-.27*		.31***		.31**
Step 3	.26***		.18**		.34***		.35***	
Children's ADHD		.39***		.24		-.28**		-.35**
Child-mother attachment		-.29**		-.20		.32**		.35**
Child-father attachment		-.19		-.22*		.28**		.27**
BRIEF: Behavior regulation		-.00		.34		-.15		-.43*
BRIEF: Metacognition		.02		.07		-.08		.09
BRIEF: Global executive		-.21		-.68*		.35		.64**
Overall R^2	.26***		.18**		.34***		.35***	

BRIEF = Behavior Rating Inventory of Executive Function. * $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion and Conclusion

Overall, this study holds various theoretical and practical implications that will be discussed in the symposium. For example, this study helps clarify previous inconsistent outcomes on EF among children with ADHD by using a teacher report that has been recommended for its strong discrimination between clinical and non-clinical groups. Findings also highlight the possible protective role of children's secure relationships with their fathers and mothers and the possible deleterious role of EF and ADHD symptoms as influencing elementary school children. The intrapersonal outcomes for EF may offer a new perspective on the non-academic impairments possibly accompanying ADHD. Considering the dearth of evidence regarding these factors for children with ADHD, the current outcomes may raise some important directions for future research, such as examining possible reciprocal relationships between attachment and EF.

Results also underscored the need to design effective interpersonal and intrapersonal interventions for children with ADHD in family and school settings. Whereas attachment-focused interventions may be useful for children with both groups, the current results clearly indicated the greatest attachment impairments in the group of children with ADHD and specifically with fathers. School-based interventions may consist of various methods for

remediating both cognitive and affective EF within school settings, targeting specific EF areas like developing inhibitory skills and mindfulness (e.g., Otero, Barker, & Naglieri, 2014).

Implicit Theories, Family Support, Academic Self-Efficacy, Hope, and Achievements

Malka Margalit and Adi Mana

School of Behavioural Sciences, Peres Academic Center and Constantiner School of Education Tel Aviv University, Israel.

The increase number of students with specific learning disabilities, who are granted with test accommodations, is particularly dramatic during the transition to high school, reflecting students' reactions to the new environmental conditions and extended academic demands (Forgan & Vaughn, 2000). Students who experience prolonged academic difficulties in reading and writing, due to their specific learning disabilities (SLD) often have implicit theories, expecting the accommodations to help them succeed and get comparable grades as their peers.

Test accommodations are changes made to tests or testing conditions that allow students with SLD such to demonstrate their knowledge regardless of their difficulties such as slow reading or writing (Conderman, Liberty, & DeSpain, 2017). Yet, even although they use these accommodations, often their achievements remain lower than their typical peers. Implicit theories (Dweck, 2008, 2017) are assumptions in an individual's belief and mental representations that strongly influences his or her goals, achievements, and relationship patterns. Fixed Implicit Theories are less adept at managing changes and challenges, while Growth Implicit Theorists are more adept at managing changes and challenges. Many times students are not aware of their implicit theories, although they have a significant impact on their behavior (Bernecker, et al, 2017). Students' implicit theories of test accommodations as a change agent were rarely examined. The objective of the current study is to present a model of mediating factors between SLD and academic achievements, including implicit theories about the accommodations, family support, academic self-efficacy and hope.

Only few studies examined students' perceptions of their accommodation. For example, students in focus groups (Baker, & Scanlon, 2016) stated that they are poorly informed about their accommodations. They confirmed their needs for accommodations, and considered themselves to have the right to them. A comprehensive survey (Lovett, & Leja, 2013) demonstrated that all students generally perceive testing accommodations to be beneficial, but students with disabilities expected greater benefits. Although implicit theories of growth and changes often predict better academic success for typical students, studies revealed that sometimes these theories were not materialized (Witmer, et al., 2018), and students with SLD did not get improved outcomes.

We hypothesized that in addition to implicit theories, the family support, academic self-efficacy and hope will mediate of the relations between SLD and achievements among high school students with and without SLD.

The study has unique theoretical importance, focusing attention not only on the significant role of implicit theories, but especially emphasizing their relations with personal and family factors. The study has also an educational implication by sensitizing educators to the critical role of the psychological meaning of accommodations, as well as to additional personal and interpersonal predictors.

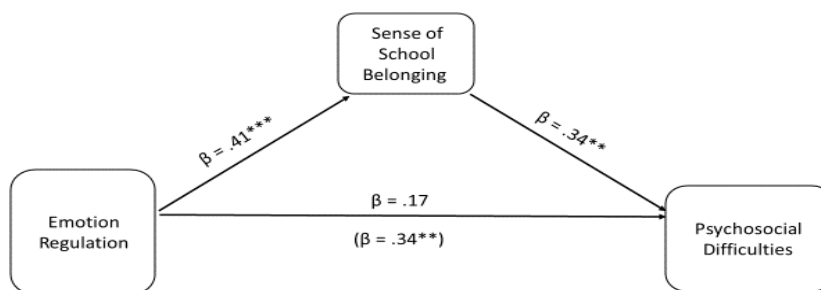
Method

The sample consisted of 111 students with SLD entitled to get accommodations in state examinations (by the Ministry of Education committees), and 159 typical peers. All the participants were 10th grade students from 9 classes in three high schools (ages $M = 15.78$, $SD = 0.46$). The questionnaires were presented at their classes.

The following instruments were used: the implicit theory about accommodations (Margalit, 2017); Family Support Scale from MSPSS (Zimet, Dahlem, Zimet & Fanley, 1988); Mean grades (History, Mathematics and English as a second language); Academic Self Efficacy - ASE ((Zimmerman et al., 1992); Trait Hope Scale (Snyder 2002).

Results

As a preliminary analysis, MANOVA revealed groups' main effect [$F(5,262) = 5.10, p < .05$, partial $\eta^2 = .08$] and gender main effect [$F(5,262) = 2.98, p < .001$, partial $\eta^2 = .05$] and no interactions. Students with SLD demonstrated lower mean grades, and higher levels of implicit theories than their peers. They believed that accommodations are valuable and support their academic success. No significant differences were found in the remaining factors. A Serial Multiple Mediation was performed using PROCESS (Hayes, 2013). It demonstrated the mediating roles of implicit theories of growth, family support; ASE and hope in predicting achievements of students with and without SLD (see Figure).



Conclusions

The results demonstrated the value of the implicit beliefs about test accommodations for students with SLD. Yet, the implicit theories by themselves did not predict achievements directly, but only through family support, ASE and hope. Special attention is focused on the unique role of the hope as a predictor to academic achievements. Intervention that will focus on promoting growth implicit theories (and not only provide accommodations) and stimulating hope may predict adaptable achievements for students with SLD. Educational and interventional implications will be discussed at the symposium.

2. Non-cognitive Predictors of Math Achievement

Participants

Lars Orbach, Universität Duisburg-Essen, Germany.

Elke Baten, University of Ghent, Belgium.

Karin Kucian, Center for MR-Research and Children's Research Center, University Children's Hospital, Zurich, Switzerland.

Discussant:

Delphine Sasanguie, KU Leuven Kortrijk, Belgium.

Abstract

Math is often regarded as a serious and reason-driven subject that mainly loads on cognitive factors. However, we know that emotions, attitudes and motivation affect mathematical learning and performance as well. This symposium aims at highlighting these non-cognitive factors of mathematical performance. The first presentation shows that parental expectations, self-evaluation of competencies and motivation for mathematics predict math abilities and partially mathematical learning disabilities, too. Presentation 2 reveals how anxious emotions experienced during mathematical situations manifest in physiological brain alternations. The last presentation applies the psychological state-strait approach on math anxiety, differentiating disparate findings regarding emotional effects on math performance. It is examined, how performance-enhancing and performance-inhibiting effects occur in children with math anxiety. The significance of non-cognitive factors for math performance is demonstrated. As influences on math performance are investigated from educational and neuropsychological perspectives, the symposium contributes to an integration of different disciplines dealing with mathematical learning. It gives answers to the question, in which way mathematical difficulties are predicted by motivational and emotional factors. Educational implications can be derived from the studies compiled in this symposium.

Using the Opportunity-Propensity framework to examine (non)-cognitive predictors of math abilities in children with and without Mathematical Learning Disabilities.

Elke Baten^{1*}, Annemie Desoete^{1,2},

¹ Department of Experimental Clinical and Health Psychology, University of Ghent, Belgium

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Objectives

Mathematical Learning Disabilities or MLD is a neurodevelopmental disorder characterized by mathematic skills substantially lower than expected with regard to the individual's chronological age and by persisting math problems despite interventions that target those difficulties. Worldwide, the prevalence of MLD is estimated between 5 and 7 %. In addition, some authors propose that MLD is a heterogeneous disability with a procedural and a semantic memory subtype. The procedural subtype is characterized by a delay in the acquisition of procedural calculation procedures. In contrast, the semantic memory subtype is marked by a lack of fact retrieval fluency. The etiology of MLD is considered to be multifactorial. A lot of research has focused on specific predictors such as intelligence, working memory, genetic predisposition, environmental factors, etc. However, according to the Opportunity-Propensity model (Byrnes & Miller, 2007), it is important to combine predictors and investigate how multiple predictors interact and explain learning all together because this is the only way to get insight in the relative importance of predictors when controlling and taking into account other predictors. In this model, predictors are grouped in three categories. Propensity factors (P) are variables that make people able (e.g., intelligence) and/or willing (e.g., motivation) to learn. Opportunity factors (O) include contexts and variables that expose children to learning content (e.g., home environment, classroom instruction). Antecedent (A) or distal variables, for example SES, are present early in a child's life and explain why some people are exposed to richer opportunity contexts and have stronger propensities for learning than others (Byrnes and Miller, 2007, 2016; Wang and Byrnes, 2013). There is already evidence for this model based on secondary datasets but there is currently no primary data available that simultaneously takes into account A, O and P factors in children with and without MLD.

Method

In this study, the mathematical abilities of 114 school-aged children (grade 3 till 6) with and without MLD were analyzed and combined with information retrieved from standardized tests and questionnaires. All children in the MLD group met the criteria for MLD, and performed below average (substantially and quantifiably, below the 16th percentile), while performance was resistant to instruction. Comorbidity with reading disabilities, Attention Deficit Hyperactivity Disorder (ADHD) and Developmental Coordination Disorder (DCD) was allowed, because of the high comorbidity rates with MLD.

Within the model the following aspects were assessed:

- *Opportunity factors*: teacher questionnaire on years of experience and teaching hours
- *Antecedent factors*: parental questionnaire on aspirations, birth order, birth weight and socioeconomic status.
- *Propensity factors*:
 - Intelligence (WISC-III-NL), working memory (CELF-IV-NL)

- Motivation, self-esteem, temperament, subjective well-being, self-perceived competence: standardized and validated questionnaires for the children
 - Personality: standardized and validated parental questionnaire
- *Mathematical abilities*: two standardized tests were administered, one test to measure fact retrieval speed (Arithmetic Number Fact Test (de Vos, 2002); one to measure procedural accuracy skills Cognitive Developmental skills in aRithmetics Test (Desoete and Roeyers, 2002)

Results

Results indicated significant differences in personality, motivation, temperament, subjective well-being, self-esteem, self-perceived competence and parental aspirations when comparing children with and without MLD. In addition, A, O and P factors were found to underlie mathematical abilities and disabilities. For the A factors, parental aspirations explained about half of the variance in fact retrieval speed in children without MLD, and SES was especially involved in the prediction of procedural accuracy in general. Teachers' experience contributed as O factor and explained about 6% of the variance in mathematical abilities. P indicators explained between 52 and 69% of the variance, with especially intelligence as overall significant predictor. Indirect effects pointed towards the interrelatedness of the predictors and the value of including A, O and P indicators in a comprehensive model. The role parental aspirations played in fact retrieval speed was partially mediated through the self-perceived competence of the children, whereas the effect of SES on procedural accuracy was partially mediated through intelligence in children of both groups and through working memory capacity in children with MLD. Moreover, in line with the componential structure of mathematics, our findings were dependent on the math task used. Different A, O and P indicators seemed to be important for fact retrieval speed vs. procedural accuracy. Also, mathematical development type (MLD or typical development) mattered since some A, O and P factors were predictive for MLD only and vice versa.

Conclusions

The current findings seem to indicate that children with MLD might be more sensitive to rewards, less open to new experiences and less conscientious. In addition, they were less autonomously motivated and had lower levels of subjective well-being, lower self-esteem and lower self-perceived competence. These findings suggest the importance of positive feedback and psychoeducation including the enhancement of the autonomous motivation for mathematics in those children, in addition to the focus on their math acquisition. Therapy should focus on their strengths and reward small positive steps in the correct direction. Practical implications of these findings and recommendations for future research on MLD and on individual differences in mathematical abilities are provided. The results of one wave of data-collection will be presented next to preliminary longitudinal results of combining wave 1 and wave 2 of data-collection.

Nightmare math: What specific anxiety can do to the developing brain

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Objectives

Adequate mathematical competences are currently indispensable in professional and social life. However, mathematics is often associated with stress and frustration and the confrontation with tasks that require mathematical knowledge triggers anxiety in many children (for review see Dowker, Sarkar et al. 2016). Math anxiety is not only associated with immediate negative emotional reactions but also has detrimental long-term consequences for career choice, employment, and professional success. Although the specific causes and effects are unclear, there is conclusive proof that math anxiety interferes with mathematical performance (for review see Suárez-Pellicioni, Núñez-Peña et al. 2016) and seems to be particularly common in children with math learning disabilities, such as developmental dyscalculia (DD) (for review about DD see Kucian and von Aster 2015). Moreover, there is a growing body of evidence that stressful events can even affect brain structure (Zach, Vales et al. 2016). Therefore, the goal of the present study was to examine the consequences of mathematical anxiety on grey matter brain volume in typically achieving children and children with DD.

Particularly children with low numeracy skills, but also typically developing children often have negative attitudes towards mathematics, associate mathematics with frustration and develop specific math anxiety (Wu, Willcutt et al. 2014). Given that math anxiety severely interferes with math learning and performance, it is crucial to understand its behavioural and neuronal underpinnings. We demonstrate that math anxiety hinders children in arithmetic and is related to a volume decrease of the main brain region for fear processing. This emphasizes the far-reaching outcome emotional factors in mathematical cognition can have and encourages educators and researchers to consider math anxiety to prevent detrimental long-term consequences on mental and physical health, school achievement, employment prospects, and quality of life.

Methods

In 43 children (between 7.8 and 15.9 years), including 23 children with DD and 20 gender- and age-matched control children, we combined high resolution structural MRI of the whole brain (3 Tesla GE scanner) and neuropsychological assessments including mathematical performance, number line performance, arithmetic, magnitude comparison, intelligence, working memory, reading skills, and handedness. Mathematical anxiety was assessed by the Math-Anxiety-Interview for German speaking primary school children (MAI) (Kohn, Richtmann et al. 2013), which recommends the child to rate its anxiety intensity concerning four math related situations that are verbally and pictorially presented. Brain images were processed by FreeSurfer (v5.3.0, <http://surfer.nmr.mgh.harvard.edu>), which enabled us to parcellate the brains into 26 subcortical and 148 cortical grey matter volumes. Volumes were

then correlated with the intensity of experienced math anxiety to examine the relation between grey matter alterations and mathematical anxiety.

Results

Present findings demonstrate for the first time that math anxiety in children is associated with alterations in brain volume. In particular, the right amygdala volume was reduced in individuals with higher math anxiety, which represents the key area in our brain for negative emotional processing such as fear, stress and anxiety.

On a behavioural level, our findings show that math anxiety is present in children with and without DD, however, children with DD show higher scores of math anxiety. Moreover, our findings corroborate that math anxiety has detrimental effects on mathematical performance, particularly on arithmetical tasks that require working memory because anxiety usurps working memory resources. No significant relationships between math anxiety and general factors, such as age, intelligence, or working memory were found. Additionally, no association between math anxiety and domain-remote skills, as reading was evident.

Regarding gender differences, our results indicate that girls and boys performed at even cognitive levels and experienced math anxiety equally often.

Conclusions

To conclude, present findings add strong evidence that mathematical anxiety is present at the beginning of formal schooling and persists during schooling. Mathematical anxiety not only hinders children in developing mathematical abilities, but it is also associated with altered brain structure in negative emotional circuits implicated in other types of anxiety. In particular, math anxiety in children most likely leads to a decrease of right amygdala volume probably due to excitotoxic processes. This growing knowledge underscores the important role of emotional factors in mathematical cognition and encourages educators and researchers alike to consider math anxiety, especially in children with DD, since these children are particularly prone to develop math anxiety.

State- und Trait-Math Anxieties – performance-inhibiting predictors of math achievement?

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Objectives

This study investigated math anxiety (MA) during the transition from primary to secondary school. Currently, very disparate findings exist for these school years, which can be explained amongst others by inconsistent definitions and different operationalizations of math anxiety (Ashcraft, Krause & Hopko, 2007). The present research aims at contributing to the definition of terms. For this purpose, questionnaires on the basis of the psychological state-trait-anxiety model were used. State-math anxiety (s-MA) is a temporarily and situation-related anxiety reaction, which is associated with an increased arousal of the autonomic nervous system. Trait-math anxiety (t-MA) as a personality trait includes an acquired and relatively enduring disposition of an individual. Due to this disposition the individual perceives a variety of math situations as ‘potentially dangerous’ (Spielberger 1972). A main goal of the study was to examine, how anxiety as an emotion influences mathematical learning.

Methods

In the present study t-MA (MAQ 4-5/ $\alpha = .83-.92$), s-MA (KAT-III/ $\alpha = .77-.78$), test anxiety (PHOKI/ $\alpha = .78$), attitudes towards mathematics, self-rating of math skills (all MAQ 4-5), math achievement (basic number skill test/ $\alpha = .86-.89$) and intelligence (CFT 20-R/ $\alpha = .92$) of 1179 students (48.6% girls) from grades 4 and 5 were assessed in total. 197 children with MLD were included in the sample. 19 schools from the Ruhr area and the surrounding area (Germany) participated in this study. All children attended regular schools. Students with special educational needs could not be included in the study. The data was collected on three days at the end of school year in summer 2017.

Results

In both of the grades existed a negative correlation between s-MA and math achievement, also when controlling for test anxiety. Children with higher IQ ($IQ \geq 110$) had a greater negative relation between MA and math achievement than children with lower IQ ($IQ \leq 90$). Like in previous surveys to t-MA, no significant negative correlation was found. Actually, when examining different t-MA expressions, a performance-enhancing effect could be observed.

T-MA and s-MA were closely related, whereby more children experience s-MA. 30.5% of all children experienced situation-related math anxiety reactions (s-MA), 17.3% showed a relative enduring disposition of math anxiety (t-MA). 7.2% had both MA-types (s-MA and t-MA), which complies with a narrow and clinical definition of MA. Children with both MA-types (s-MA and t-MA) exhibited much poorer performances than children with only t-MA or no MA. Additionally, these children had much lower self-ratings and attitudes than children with only s-MA, t-MA or no MA.

Children with MLD had more s-MA and test anxiety, exhibited lower self-ratings, attitudes and IQ than children without MLD. As key factors for the development of math difficulties both MA-types were examined in a regression analysis. Significant predictors for math difficulties during the transition from primary to secondary school are self-rating ($\beta = -.154, p < .001$), s-MA ($\beta = .249, p < .001$) and IQ ($\beta = .355, p < .001$). T-MA is a significant

predictor with a small positive effect ($\beta = .068, p = .018$). The overall model fit was $R^2 = .332$ ($F(6, 896) = 74.164; p < .001$).

Conclusions

These findings underline the complexity of the relationship between MA and math performance. In primary school, children already experience s-MA, which directly influences their math performance in a negative way. Perhaps no relatively enduring t-MA-disposition has been developed at this point. This specific t-MA would be developed by often experiencing s-MA and would cause that individuals perceive a variety of math situation as potential dangerous. As reaction more s-MA would appear, which influence math performance negatively and has strong negative consequence for attitudes towards mathematics and self-rating of math skills. On the other hand, some trait-anxious students seem to perform well. They do not experience math anxiety reactions (s-MA). Their fear of failure (t-MA) has a performance-enhancing effect, probably due to increased effort in training. Children with MLD are emotionally, motivationally and cognitively handicapped, which underlines the importance of multidimensional funding. In general, the findings highlight the benefit of the state-trait-anxiety model for research on MA and assessment of MA. The differentiation between these two anxiety types seems to be one reason for inconsistent findings in math anxiety research and might initiate fruitful further investigation. As a consequence, all research results need to be interpreted under the consideration of the operationalization. Furthermore the model allows accessing performance-inhibiting and performance-enhancing effects of MA in primary and secondary school students.

3. Research on Learning Difficulties, Chaos in need for Organization. The importance of Participant Selection Criteria, Categorization and Longitudinal Designs.

Participants

Kiran Vanbinst, KULeuven Belgium.

Elie Bellon, KULeuven Belgium.

Jolijn Vanderauwera, KULeuven Belgium.

Discussant:

Pol Ghesquière, KU Leuven, Belgium.

Abstract

Reading and arithmetic constitute two quintessential building blocks of children's education, but for many children learning to read and/or to calculate is (extremely) challenging, i.e. children with dyslexia and/or dyscalculia. Numerous studies compared the neurocognitive profiles of children with versus without learning difficulties, to capture the origin of these learning difficulties. The criteria used to select children with learning difficulties largely varies across studies and rarely matches the clinical criteria for diagnosing dyslexia/dyscalculia. It is, consequently, difficult to compare research findings across studies, and the generalizability of results is arguable. Surprisingly, only a limited number of studies relied on longitudinal data to investigate the persistency of the learning difficulties. The goal of this symposium is to discuss research related difficulties of studies investigating dyslexia and dyscalculia, with a specific emphasis on participant selection and categorization, and the advantages of longitudinal designs for investigating neurocognitive correlates of reading and arithmetic. More specifically, the first presentation will demonstrate the importance of longitudinal designs, selection criteria and test materials for investigating mathematical learning difficulties, by reviewing previous research and presenting longitudinal work in which groups of children were no longer identified based upon predetermined cut-off criteria, but by using a model-based clustering approach. The second presentation will elaborate on the generalizability of studies investigating the typical development of mathematical abilities to the population of children with low(er) mathematical performance categorized as *mathematical difficulties*, *mathematical learning disorders* or *developmental dyscalculia*; and discuss the impact of these categorizations when interpreting longitudinal research on arithmetic. The final presentation will elaborate on factors influencing research on dyslexia, by (1) presenting longitudinal findings on the stability of technical readings skills in individuals, (2) reviewing the selection criteria applied in research to define groups of individuals with dyslexia, and (3) comparing categorical vs. continuous approaches in dyslexia research.

Investigating persistent difficulties in arithmetic fluency: From a top-down categorization of children into subgroups to a data-driven bottom-up categorization.

Kiran Vanbinst, Eva Ceulemans, Pol Ghesquière and Bert De Smedt

KULeuven Belgium

Persistent difficulties in arithmetic fluency constitute the hallmark of children with mathematical learning difficulties (MLD) (American Psychiatric Association, 2013; Geary et al., 2012). Studies also found that arithmetic deficits co-occur with difficulties in symbolic numerical magnitude processing (De Smedt et al., 2013, for a review), suggesting that screening these symbolic skills might be useful for detecting children at risk for MLD (Brankaer et al., 2016; Nosworthy et al., 2013). Vanbinst et al. (2014) contrasted for example children with persistent MLD ($n = 14$; 1 boy, 13 girls; mean age: 9 years 2 months) and typically developing children ($n = 14$; 4 boys, 10 girls; mean age: 9 years 6 months) at three time points, to explore whether differences in arithmetic learning are associated with differences in symbolic and non-symbolic numerical magnitude processing (symbolic/non-symbolic comparison tasks), working memory (listening recall, block recall, nonword repetition) and phonological processing (phoneme deletion, spoonerism, rapid automatic color/letter naming). Both groups did not differ in terms of intellectual ability (Raven's Standard Progressive Matrices), age, reading ability (standardized Dutch One-Minute-Test version B), sex and socioeconomic status (maternal educational degree). These longitudinal data showed weaker arithmetic performance in children with persistent MLD than in typically developing children at each time point. Importantly, both groups differed in symbolic numerical magnitude processing and phonological processing, but not in non-symbolic numerical magnitude processing and working memory. In the above mentioned longitudinal study low achievement and persistency criteria were combined to define children with persistent MLD. Children were included in the persistent MLD group, if they performed below the 25th percentile (see also Swanson & Jerman, 2006) on a general standardized mathematics achievement test at three time points. This persistency criterion is crucial because many children with low achievement in mathematics do not necessarily maintain this low achievement over time (Mazzocco & Räsänen, 2013). According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013), the most widely accepted nomenclature used by clinicians (and researchers?) for the classification of developmental disorders such as dyscalculia, individuals with MLD are characterized by a specific pattern of learning difficulties comprising problems with processing numerical information, arithmetic fact learning deficits and difficulties in solving calculations accurately and fluently. This diagnostic definition of MLD stresses that learning difficulties must persist for at least 6 months. Surprisingly, many published studies define children with MLD by only considering low achievement and not by additionally taking the persistence of these difficulties into account. A second important issue, is the fact that the cut-off points used to determine low achievement also vary across studies. The longitudinal study by Vanbinst et al. (2014) used the 25th percentile as cut-off point, as other studies used stricter cut-off points, i.e. the 10th percentile. A third issue is the lack of universally accepted screening tools for defining MLD, which has as a consequence that a variety of tasks with different contents were used to capture children's level of mathematics achievement. This is surprising given that the DSM-5 criteria of MLD emphasize difficulties specifically in arithmetic fluency.

Taking into account the above-mentioned issues, Vanbinst et al. (2015) decided to no longer use a top-down categorization of children into subgroups based upon predetermined

cut-off criteria, but to, as an alternative, employ a data-driven bottom-up approach in order to identify different clusters (or groups) with the use of a model-based clustering approach on different parameters of arithmetic fluency assessed at the start of three subsequent school years, i.e., third, fourth and fifth grade. This method additionally provides the opportunity to examine whether distinct profiles of arithmetic fluency also differ in terms of domain-specific and domain-general cognitive skills that have been associated with dyscalculia or individual differences in arithmetic fluency. The cluster analysis revealed three profiles – *slow and variable* ($n = 8$), *average* ($n = 24$) and *efficient* ($n = 20$) – that were marked by differences in children’s development in arithmetic fluency from third to fifth grade. These profiles did not differ in terms of age, sex, socioeconomic status and intellectual ability. The three profiles differed in non-symbolic and symbolic numerical magnitude processing as well as phonological processing, but not in digit naming or working memory. After cluster differences in general mathematics achievement (standardized mathematics achievement test from the Flemish Student Monitoring System) and reading ability were additionally controlled for, only differences in symbolic numerical magnitude processing remained significant.

The current data highlight that the model-based clustering approach can be successfully applied to answer questions in the field of mathematical cognition. In particular, our longitudinal data reveal that especially symbolic numerical magnitude processing represents an important variable that contributes to subject variability in children’s acquisition of arithmetic fluency.

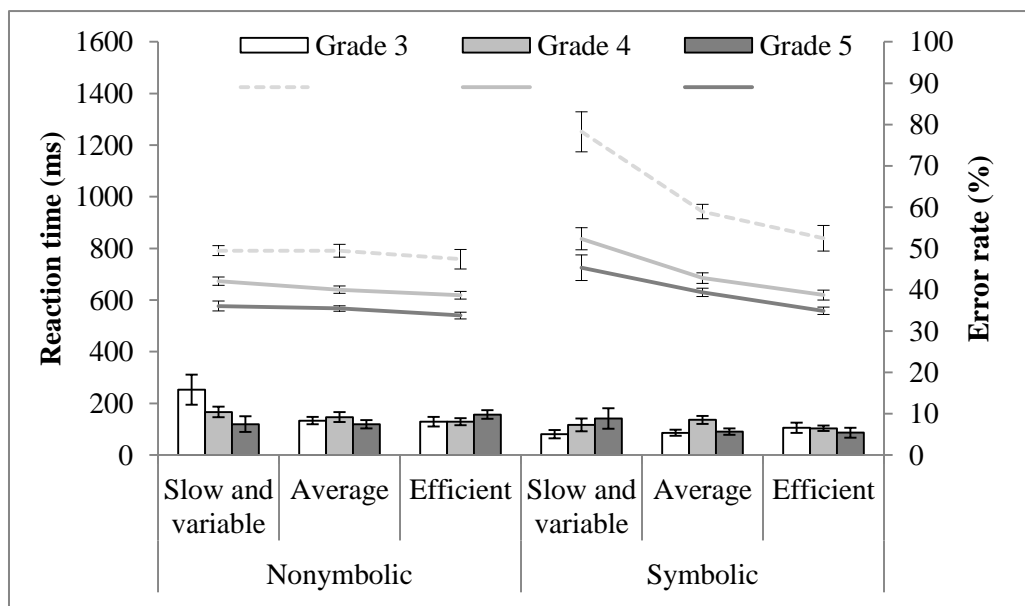


Figure. Mean reaction time and error rate (% incorrectly solved problems) by cluster per numerical magnitude comparison task.

Who is ‘normal’? — The impact of different categorizations of children’s mathematical performance on research conclusions within a longitudinal study on arithmetic.

Elien Bellon, Wim Fias, and Bert De Smedt
KULeuven Belgium

In this longitudinal study we investigated the role of specific cognitive factors (i.e., metacognition and cognitive control) in arithmetic, starting from an individual differences approach. We investigated this issue in 127 typically developing 2nd graders and followed them up one year later (3rd grade). All children with a learning disability – as indicated via parental questionnaires – were excluded from the initial analyses. We used experimental task to investigate cognitive control (n-back task, WCST, Flanker task and animal Stroop task), metacognition (trial-by-trial confidence rating after the arithmetic items) and numerical magnitude processing (single digit comparison task). Both frequentist and Bayesian statistics were used to investigate how cognitive control, metacognition and numerical magnitude processing were (jointly) related to arithmetic. Our findings revealed that calibration of confidence and numerical magnitude processing were significantly related to and both explain unique variability in arithmetic in both grades. The data stress the importance of children’s calibration of confidence, which should be considered as an important variable in studies on children’s arithmetic performance and at the level of (mathematics) education, where children can be learned to identify their own errors and consequently learn from their mistakes.

One question that remains is: Are these results only applicable to ‘typically developing children’ or do they also apply to children with mathematical difficulties or a learning disorder? In the literature the operationalization of ‘mathematical difficulties’ or ‘mathematical learning disorders’ varies considerably. This has an impact on the generalizability of abovementioned results. For example, children were classified as ‘children with math difficulties’ in Jordan et al. (2003) if they had a fact mastery score below the 25th percentile, in Martin et al. (2013) if they had a general math score below the 32nd percentile. Mazzocco et al. (2008) used a 10th percentile boundary to identify children with ‘mathematical learning disabilities’, Navarro et al. (2012) classified children scoring 1 SD below the mean on The Early Numeracy Test as ‘low achievers’. Toll et al. (2014) classified children with a score below the 15th percentile on The Early Numeracy Test as ‘very low numeracy’. To gain insight into this ongoing issue, we applied different definitions and/or operationalizations used in the literature to our sample.

We discuss the (different) results based on these different categorizations and address some implications related to longitudinal designs and participant selection.

Studying the heterogeneous group of individuals with developmental dyslexia: the influence of individual differences, selection criteria and continuous vs. categorical approaches.

Jolijn Vanderauwera and Pol Ghesquière
KULeuven Belgium

There is a bulk of studies investigating the underlying neurocognitive factors of developmental dyslexia. However, variability in many factors affects research outcome, and therefore also comparability between studies. We will present some key factors that drive (variability of) research outcomes.

First, we will investigate the stability of technical reading skills in individuals by means of a longitudinal design (Vanderauwera et al., 2017; Vanvooren et al., 2017). We will present word and pseudo-word reading skills from grade 2 until grade 5 from a longitudinal study including 87 children.

Second, the selection of participants is a critical factor, that largely varies between studies. Different sets of criteria are being used to define the same heterogeneous group of ‘individuals with dyslexia’. We will present an overview of different applied criteria and give an example, based on our longitudinal dataset, of the heterogeneity of the individuals with dyslexia. Remarkably, only few studies apply a longitudinal design in order to measure the persistency of the reading (dis)abilities.

Further, different statistical approaches are being used with the identical aim to investigate the underlying neurocognitive factors of dyslexia. Whereas some studies use continuous statistical analyses methods, other studies apply categorical approaches. We will discuss strengths and fallacies of both methods in relation to the participants that are being studied.

4. Emotional factors in Specific Learning Disorders and Difficulties.

Participants

Irene C. Mammarella Developmental and Social Psychology, University of Padova, Italy.

Julia M. Carroll, Centre for Advances in Behavioural Science, Coventry University, UK.

Mika Paananen, University of Jyväskylä Department of Education, Finland.

David Giofrè, School Nat. Sciences and Psychology Liverpool John Moores University, UK.

Discussant:

Ann Dowker University of Oxford, United Kingdom (UK).

Abstract

In the present Symposium positive emotional factors (such as self-efficacy and resilience) and negative emotional factors (such as anxiety and depressive symptoms) in relation to both reading and mathematics will be examined. In particular, the relation between self-efficacy and reading decoding and comprehension will be considered in the talk of J. Carroll and A. Fox. Self-rated self-regulatory efficacy in children with and without learning disabilities will be analysed in the study of Mika Paananen and co-authors. Finally the relation among working memory, negative affect (e.g., general anxiety, depression) and personal resources (e.g., self-concept, ego-resilience) on mathematical and reading literacy will be examined by Dr. Giofrè and co-authors. Possible implications for different profiles of specific learning disabilities will be discussed.

The role of self-efficacy in decoding and reading comprehension.

Julia M Carroll ^{*}, Amy C. Fox ¹ ¹ Department of Psychology, University of Warwick, UK.

Objectives

It is well established that reading difficulties are caused by cognitive difficulties, including phonological processing difficulties (Carroll, Solity & Shapiro, 2016). It is also well established that there is a reciprocal relationship between reading achievement and self-belief (Morgan & Fuchs, 2007). Recent research has suggested that the relationship between reading and motivation even closer is for children with poor reading (McGeown, Norgate & Warhurt, 2012). This study sought to understand the links between self-efficacy and reading difficulties. Self-efficacy is likely to play a particularly important role in developing reading skills due to the self-teaching mechanism involved in the reading process: successfully deciphering a printed word helps a child to learn to recognize that word automatically in the future (Share, 1995). Therefore, these experiences are vital to increasing a child's reading vocabulary, reading fluency and reading comprehension. A child who tries to read an unknown word and succeeds (thus increasing their reading vocabulary and raising their self-efficacy) is likely to try to attempt a similar task in the future (Henk and Melnick, 1995). Wigfield and Guthrie (1997) and Zimmerman (2000) have examined the influence of students' belief in their own reading abilities and found that students with low reading self-efficacy tried to avoid challenging reading activities and tended to withdraw from tasks they perceived as too difficult.

Methods

In this study 179 children between 8 and 11 years old attending mainstream state schools in the UK completed a self-report measure of reading self-efficacy together with measures of reading comprehension and word reading, working memory, auditory short-term memory (STM), phonological awareness and vocabulary. Teachers were asked to nominate children with a wide range of literacy abilities, and children with poor reading skills were defined in two ways: in terms of single word reading fluency and in terms of comprehension skill.

Results

Reading self-efficacy was associated with word reading, but not with reading comprehension, and children with poor reading comprehension did not show poorer self-efficacy than those with good reading comprehension. There were some indications that the association between reading skills and self-efficacy was closer in children with poor word reading in comparison to children with good word reading.

Conclusions

Reading self-efficacy may be particularly closely linked to word reading skill in poor readers. This pattern is in line with previous research showing this pattern for reading motivation. However, the same pattern was not shown for children with poor reading comprehension. It is argued that these findings may reflect important differences between reading self-efficacy and more general measures of reading motivation and engagement, and could have important implications for intervention.

Self-Regulatory Efficacy Beliefs and Underlying Sources among Elementary School Pupils with and without Learning Difficulties.

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³ Niilo Mäki Institute, Jyväskylä, Finland

Objectives

The objective of the study was to investigate self-reported self-regulatory efficacy and four theory based sources of self-regulatory efficacy (mastery experiences, vicarious experiences, social persuasion, and physiological/emotional state; Bandura, 1997) in elementary school pupils. Among pupils with learning difficulties (LD), the development of self-regulatory skills may be hindered as lack of fluent basic skills strain self-regulatory resources (Hecht, 2002; Pikulski & Chard, 2005) and use of flexible problem solving and learning strategies (Meltzer & Krishnan, 2007). LD may also be with low self-regulatory efficacy (Hampton & Mason, 2003; Klassen, 2010). In the present study (1) we compared self-regulatory efficacy and its sources between pupils with (LD) and without learning difficulties (No-LD). In addition to this variable-centered approach, person-oriented latent profile analysis (LPA) was applied to investigate (2) what profiles of sources of self-regulatory efficacy (i.e., profile groups) emerge among all participants, (3) how pupils with LD are distributed in these profile groups, and (4) whether there are differences in self-regulatory efficacy between the profile groups.

Examination of self-regulatory efficacy among elementary school pupils is of interest since both actual self-regulatory skills and confidence on one's own self-regulatory competencies have great influence on motivation, educational development, and learning outcomes (Caprara et al., 2008).

Methods

Participants were 1244 elementary school pupils from grades 2nd to 5th. The participants were divided into five LD groups based on their performance on reading and arithmetic tasks: pupils without learning difficulties (No-LD, $n = 937$), with reading difficulties (RD, $n = 90$), with mathematics learning difficulties (MD, $n = 117$), and with comorbid reading and mathematics learning difficulties (RD+MD, $n = 66$; total n in LD group 273). Reading performance was assessed using two time-limited reading tests. Two time-limited paper-and-pencil tasks were used to assess basic arithmetic skills. Data on self-regulatory efficacy and its sources were gathered with questionnaires completed by pupils. The questionnaire of self-regulatory efficacy consisted of eight items and it was based on the guidelines of Bandura (2006). The questionnaire of sources of self-regulatory efficacy based on the ideas of Usher and Pajares (2008, 2009) and it consisted of 14 items related to self-regulation needed in the school setting, i.e. adaptive behaviour, attentive control, and effort control. Differences in self-regulatory efficacy and four sources of self-regulatory efficacy between the four LD groups were tested with GLM MANOVA. LPA and additional profile group comparisons were conducted using Mplus version 7.3.

Results

Pupils with LD had lower self-regulatory efficacy than No-LD pupils ($F(3, 1206) = 23.90, p < .001, \eta^2 = .06$). They also reported less mastery experiences ($F(3, 1206) = 6.64, p < .001, \eta^2 = .02$), experienced less social persuasion ($F(3, 1206) = 5.75, p = .001, \eta^2 = .01$) and reported more negative physiological and emotional states than No-LD pupils ($F(3, 1206) = 14.06, p < .001, \eta^2 = .04$). With LPA, we were able to find five groups with different profiles of sources of self-efficacy. Almost two third of the pupils with LD ($n = 177, 65.3\%$) clustered into profile groups with “Low social support”, “Low sources”, “Emotional reaction” and “Specifically strong emotional reaction”, whereas less than half of the No-LD group ($n = 443, 45.6\%$) belonged to these profile groups. Eleven percent of all pupils ($n = 139$) belonged to the group reporting specifically strong negative emotional reactions in task setting. Almost half of them were pupils with LD. There was significant difference in distribution of pupils with MD (Wald $\chi^2(4) = 12.40, p = .015$) or with RD+MD (Wald $\chi^2(4) = 9.67, p = .046$) across profile groups. The share of pupils with MD was highest in the Low sources and Specifically strong emotional reaction groups, and share of pupils with MD+RD was highest in the Specifically strong emotional reaction group. Self-regulatory efficacy was significantly higher in profile group showing above average sources than in Low sources and Specifically strong emotional reaction profile groups (overall test Wald $\chi^2(4) = 311.39, < .001$).

Conclusions

Our results indicated clear connections between basic academic skills, self-rated self-regulatory efficacy and its sources. Analysis of profile groups showed that experiencing positive above average sources was associated with high confidence on self-regulation. Good basic academic skills raise probability for entering in positive source profile group whereas LD may hinder building self-regulatory confidence and be a risk for negative emotional reactions in task situation.

How working memory relates to negative affect and personal resources influencing mathematical and reading literacy.

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Objectives

Previous studies investigated the relation between working memory (WM) and negative affect (e.g., general anxiety, depression) or personal resources (e.g., self-concept, ego-resilience) on mathematical and reading literacy. Although amply explored, previous research usually considered these factors in isolation. In an effort to clarify this picture, the present study examined the simultaneous role of WM, negative affect and personal resources in relation to mathematical and reading literacy.

Academic success is an essential aspect of everyday life for children throughout the world. The literature suggests that several cognitive abilities are needed to solve academic problems. In particular, working memory (WM) has long been considered one of the most important predictors of academic performance (St Clair-Thompson & Gathercole, 2006). Alongside WM, some studies considered the role of other aspects, such as the impact of anxiety and depressive symptoms on academic performance (i.e., Aronen, et al. 2005; Owens, et al. 2012). Specifically, anxiety and depressive symptoms (hereafter called negative affect) have been shown to adversely affect students' achievement (e.g., Deroma, et al. 2009; Sridevi, 2013). Self-concept and ego-resilience (hereafter called personal resources) have also been associated with academic achievement (e.g., Kwok, et al. 2007; Valentine, et al. 2004). However, the combined influence of negative affect and personal resources on academic achievement in schoolchildren, and the joint role of these variables to WM-related cognitive abilities consequently, remain unclear.

Methods

The study involved 134 schoolchildren in sixth and eighth grades (71 male and 70 female, Mage = 12.54 years, SD = 1.12) in sixth grade (n = 63, Females = 56%) and eighth grade (n = 78, Females = 46%).

The following materials were used:

Working memory tasks: 1) Verbal dual tasks (De Beni, Palladino, Pazzaglia, & Cornoldi, 1998); 2) Listening span test (Daneman & Carpenter, 1980; Palladino, 2005); 3) Visuospatial dual tasks (Mammarella & Cornoldi, 2005); 4) Dot matrix task (derived from Miyake, Friedman, Rettinger, Shah, & Hegarty, 2001).

Academic achievement tasks: Mathematical and reading literacy (INVALSI, 2011).

Self-report measures on negative affect: 1) The Revised Children's Manifest Anxiety Scale: Second Edition (RCMAS-2; Reynolds & Richmond, 2012); 2) The Children's Depression Inventory (CDI; Kovacs, 1988); 3) The Questionnaire for the Assessment of Psychopathology in Adolescence (Q-PAD; Sica, Chiri, Favilli & Marchetti, 2011)

Self-report measures on personal resources: 1) The Ego-Resiliency Scale (ER; Block & Kremen, 1996); 2) Multidimensional Self-Concept Scale (MSC; Bracken, 2003).

Results

The R program (R Core Team, 2016) with the “lavaan” library (Rosseel, 2012) was used to perform confirmatory factor analysis (CFA) and structural equation modeling (SEM) models.

Our final model suggests that the effect of negative affect (i.e., general anxiety and depressive symptoms) is fully mediated by WM and by personal resources (i.e., self-concept and ego-resilience). In other words, the effect of negative affect, was mediated by WM on both mathematical and reading literacy. Similarly, the effect of negative affect, was also mediated by personal resources on both mathematical and reading literacy (χ^2 (df)=174.73(128); *RMSEA*=.050; *CFI*=.958; *AIC*=11540). This model was also confirmed and replicated by using path analysis, allowing to reduce the complexity of the statistical analysis by reducing the number of variables considered in the model.

Conclusions.

Our data offer an original contribution to the literature. Our results seem to indicate that negative affect, such as general anxiety and depressive symptoms, are strongly correlated in secondary school children. Importantly, negative affect is indirectly influencing both mathematics and reading literacy through the mediation of the WM system. This is consistent with previous research supporting the role of WM in relation to negative affect factors and academic achievement (e.g., Owens et al., 2012) and is also consistent with theoretical models on anxiety, such as PET and ACT models, which highlighted that worrying could affect cognitive performances with the mediation of task-irrelevant cognitions interfering with WM (e.g., Ashcraft & Kirk, 2001; Eysenck et al., 2007; Derakshan & Eysenck, 2009). Importantly, the results of the present study expand previous literature by highlighting the mediational role of personal resources. The negative relation between negative affect and personal resources seem to suggest that self-concept and ego-resiliency are able to modulate the effects of negative affect, such as general anxiety and depressive symptoms. Both clinical and educational implications on specific learning disorders will be discussed.

5. Spelling in different languages: Do we speak and write the same language?

Participants

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Abstract

When children learn to spell, they learn to map between sounds and letters. This mapping is not always predictable, resulting in English with an alphabetic but deep or non-transparent orthography and in Dutch with a semi- or moderate transparent orthography.

The main aim of this symposium was to compare the spelling strategies between non and semi-transparent languages. Most researchers refer to phonological, morphological and orthographic strategies, summarized in the Triple Word Form Model (Arfé et al., 2012; Berninger et al., 2008). Although this model seems to be internationally accepted, the application is not always clear for certain languages like Dutch, so there the spelling in children and adolescents will be looked at. Implications for research and education will be discussed

Perils of learning to spell in English. Insights from eight Australian children and their teachers.

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Objectives

In contemporary times writing is more important than ever, and spelling is a key transcription skill for efficient writing. While little is understood about the particular challenges some children experience when learning to spell, explicit instruction is known to improve spelling performance. The case study reported in this article forms part of a larger Australian mixed-methods study examining spelling acquisition, as represented by a stratified random sample of Australian students aged 8 to 12 years (n=1,198). The present case study utilizes spelling error analysis of dictated words, and narrative and expository writing, as well as semi-structured interview data from a randomly selected sub-sample of low-achieving spellers (n=8) and their teachers (n=8). Descriptive analyses of phonological, orthographic and morphological spelling errors revealed students' common and unique challenges in learning to spell. Qualitative analysis of semi-structured interview data identified that the case study students lacked confidence in spelling and general writing, used 'sounding out' as their dominant strategy for spelling less familiar words, and displayed limited understanding or use of metalanguage associated with spelling and writing. Interview data from the respective classroom teachers revealed a lack of confidence in their ability to teach spelling, along with limitations in pedagogical content knowledge and instructional approaches. The findings highlight the need for improved understandings of ways to support students who find learning to spell challenging.

Method

Quantitative and qualitative data were obtained from a subsample of primary aged students identified as low-achieving spellers in Years 3 to 6 (n=8) and their teachers (n=8) who participated in a large mixed methods study which examined spelling acquisition among 8 to 12-year-old Australian children (n=1,198). Data presented for this case study include children's performance results in spelling, as measured by the Components of Spelling Test (CoST) (Daffern, Mackenzie, & Hemmings, 2015, 2017), a standardized dictation spelling test comprising 70 words. Internal reliability results for the CoST have been demonstrated in an earlier study with Cronbach alpha's ranging from .78 to .94 (Daffern et al., 2015). In addition, frequencies of written word types and spelling error types produced in narrative and persuasive written compositions were ascertained. These data were triangulated with transcribed semi-structured interviews conducted with the students and their teachers. Data were inductively analysed using Sproule's (2006) methodological framework, as well as techniques outlined by Willis (2006) and Elo and Kyngäs (2008).

Results

Performance across the three subscales of the CoST ranged between the 5th percentile and the 13th percentile (see Table 1). The results also revealed a general increase in subscale raw scores at each year level. Students produced errors across the three subscales, even though fewer phonological errors were made overall.

Table 1. Low-achieving spellers' raw scores and percentiles in the CoST subscales (Years 3 to 6)

		Phonological Subscale		Orthographic Subscale		Morphological Subscale	
		Raw score (out of 31)	Percentile	Raw score (out of 29)	Percentile	Raw score (out of 41)	Percentile
Yr 3	Matt	14	7	4	7	3	5
	Leanne	15	10	7	12	3	5
Yr 4	Ben	16	10	8	6	7	12
	Anna	15	7	10	9	7	12
Yr 5	Riley	18	13	11	5	8	8
	Sarah	17	8	11	5	5	5
Yr 6	David	20	12	19	9	10	5
	Kath	20	12	19	9	12	7

The results shown in Table 2 highlight individual variability in spelling difficulties but also suggest that the students may have relied heavily on simple and common words to construct their written compositions. Overall, orthographic errors (n= 243) were most prevalent, followed by morphological errors (n=161), and then phonological errors (n=98).

Table 2. Frequencies for words and errors produced in written compositions

	Total no. words	Word errors n (%)	No. whole words written (by level of lexical difficulty)				No. spelling errors		
			Level 1	Level 2	Level 3	Level 4	Phon ^a	Orth ^b	Morph ^c
Year 3									
Matt	317	94 (30)	196	118	3	0	37	48	20
Leanne	371	64 (17)	242	111	13	5	5	45	20
Year 4									
Ben	138	42 (30)	58	73	7	0	18	27	9
Anna	501	53 (11)	292	182	27	0	4	25	29
Year 5									
Riley	283	60 (21)	161	118	4	0	2	33	20
Sarah	423	40 (9)	247	166	10	0	15	22	14
Year 6									
David	545	50 (9)	285	238	22	0	7	28	17
Kath	460	59 (13)	246	194	20	0	10	15	32

Note. Lexical difficulty: 1 = simple; 2 = common; 3 = difficult; 4 = challenging (NAPLAN marking guide: ACARA, 2012); Coding based on CoST ^aPhonological errors; ^b Orthographic errors; ^c Morphological errors.

The interview data revealed qualitative challenges and limitations experienced by the low-achieving spellers and their teachers, and highlighted opportunities where the teaching and learning of spelling could be enhanced. Interactions between teachers' content knowledge, pedagogy, and student learning and self-efficacy in spelling were exposed. Table 3 summarises the teacher related themes and student related themes that emerged:

Table 3. Summary of teacher and student related themes

Teacher Related Themes	Student Related Themes
Teachers lacking in confidence in their ability to teach spelling (and for some in their own ability as spellers).	Student negative attitudes to spelling and how it is taught (e.g. stressful, lack confidence; boring; difficult; lessons are not memorable)
Teachers who see themselves as poor spellers suggesting to students who are poor spellers that spelling is not important.	Students who are poor spellers are struggling with spelling instruction (e.g. confused and misused metalanguage; difficulty understanding text book questions/tasks).
An emphasis on rote learning and weekly testing of words.	Poor spellers demonstrate limited strategies and a reliance on sounding out.
Teachers dominantly teaching for and prompting for the use of phonological information.	
An approach to spelling that is reliant on a 'program' or 'text' rather than explicit instruction based upon the strengths or needs of students.	
Teachers struggling with how best to teach spelling.	

Conclusion

Insights gained from this case study cannot be generalized to all students who struggle with spelling, and to all teachers of spelling. However, the findings illuminate confronting insights into the challenges that some primary school students can experience if their teachers are not well-equipped to teach spelling. If teachers are able to identify the underlying causes of spelling difficulties by undertaking systematic spelling error analyses, and if they know how to teach spelling strategies beyond 'sounding out', students may be afforded opportunities to learn to apply a broader repertoire of strategies. Considering significant improvements in spelling can be made by increasing the amount of explicit instruction (Graham & Santangelo, 2014), it seems logical that the participating students would have benefited from more frequent and explicit instruction. Teachers require training that combines both content knowledge (the 'what' to teach) and instructional strategies (the 'how' to teach). To enhance teachers' pedagogical content knowledge, in-service teacher training should be provided by highly knowledgeable facilitators, and collaboration with specialists such as speech and language therapists is necessary.

Spelling and precise writing skills of higher education students with dyslexia in Dutch.

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Objectives

A large scale study was set up with the aim to compare students with and without dyslexia on a large set of cognitive variables (Callens, Tops, & Brysbaert, 2012). In addition the writing skills (spelling and précis writing) of both student groups were analysed more thoroughly.

This study reveals relationships between spelling and underlying cognitive mechanisms in a semi-transparent language. Data analysis was informed by two research questions: i) what spelling errors do students with and without dyslexia make and how is the quality of their texts? and ii) how do teachers look at spelling in students with dyslexia?

Methods

We compared writings of 100 students with dyslexia and 100 age matched control students in higher education. We classified spelling errors that students made in a word and sentence dictation as phonological errors, rule-based (morpho-syntax) errors or memory-based errors (errors in words that need to be memorized because spelling is not governed by letter-to-sound conversion rules nor morpho-syntax rules).

In addition the *feeling of confidence* (or a metacognitive experience according to Efklides, 2009), was also studied and compared in both groups. We used Signal Detection analysis to estimate perceptual distances and decision boundaries when discriminating between stimulus categories. Items with a spelling error were considered as signals and items without spelling errors as noise. The distance (d') between the two categories reflected the sensitivity of the participants to the difference between correct items and items with an error. This parameter was thus a measure of the spelling skill. The decision boundary (c) reflects the metacognitive experience when one has to decide between the two stimulus categories. Sensitivity and bias corresponds to the slope and the intercept of a probit regression (Decarlo, 1988).

Results.

Students with dyslexia were more impaired in spelling than in reading, with no difference between word and sentence level. Reading speed was more impaired than reading accuracy.

Students with dyslexia made twice as much errors as their peers without dyslexia on all three categories. Proportionally, students with dyslexia made more phonological errors but less morpho-syntax errors. Phoneme-to-grapheme correspondence rules seemed less automatized in students with dyslexia than in control students.

In addition in a précis writing task students with dyslexia made proportionally less memory-based errors than the control group. It was also shown that students with dyslexia had more difficulty with capitalization and punctuation. Texts of students with dyslexia did not differ in sentence length nor the use of words. Neither was the handwriting of students with dyslexia differently judged than that of control students. Teachers, however, gave lower marks to

students with dyslexia, even when texts were typed and spelling errors were corrected. The reason seemed that teachers found texts of students with dyslexia less structured and less agreeable to read.

Moreover, students with dyslexia seemed to use different writing and spelling strategies according to the task (dictation or précis writing). In dictation they tried to compensate for their spelling problems by relying more on morpho-syntax rules. In essay writing tasks students with dyslexia tried to limit their error rate by avoiding long or complex words.

Finally, the sensitivity of the students with dyslexia was considerably lower than that of the control students ($d' = .66$; $t(186) = -3.69$, $p < .001$). However students with dyslexia were as adequate in setting their response criteria as control students. Both groups tried to optimize their performance in the light of overlapping distributions.

Conclusions

Students with dyslexia made twice as much errors as their peers without dyslexia on phonological, rule based and memory based items. In addition they had more difficulty with capitalization and punctuation and teachers found the texts of students with dyslexia less structured and less agreeable to read. Moreover, students with dyslexia tried to limit their error rate by avoiding long or complex words. Finally, students with dyslexia were as adequate in setting their response criteria as control students. This finding goes against the dual burden theory of Kruger and Dunning (1999, 2002), according to which students with dyslexia not only would be less able to detect spelling errors but in addition would be less responsive to them. By using the technique of Signal Detection Theory, we were able to show that despite the differences in spelling performance, students with dyslexia did not differ significantly in metacognitive experiences. This shows that adult students with dyslexia who enter higher education have developed adequate metacognitive knowledge and experiences to help them cope with their reading and spelling deficits.

Spelling skills in pseudowords and existing words in Dutch speaking children with and without dyslexia.

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Objectives

The purpose of this study was to explore the spelling strategies of children with and without dyslexia in the Dutch language, an alphabetic and semi-transparent orthography.

We investigated differences between morphological, syllabic, phonological, and etymological spelling strategies in children with and without dyslexia in a semi-transparent language. Data analysis was informed by two research questions: i) what is the value of the different spelling strategies? and ii) how do pseudowords add to the assessment of existing words?

Methods

In this study, 218 children from the second until the sixth grade were assessed on spelling skills. The participants with dyslexia were 40 boys and 15 girls. They were average intelligent and monolingual Dutch speaking children and matched with 163 children on age and gender.

All children completed a spelling test, ST 1-6 (Van Vreckem & Desoete, 2016). The psychometric value of the test was demonstrated in previous studies. Children had to write down existing words, orally presented in a sentence. They also had to write down pseudo words. Pseudo words don't exist but are created following the rules of the Dutch language.

Results.

Children completed existing words and pseudowords spelling tasks (see Table 1).

Table 1. Spelling strategies

Strategies	Dyslexia (Median, InterQuartileRange) n = 55	No dyslexia (Mdn, IQR) n = 163	Mann- Whitney U	Effectsize (r)
Phonological				
Existing words	<i>Mdn</i> = 31; <i>IQR</i> = 2	<i>Mdn</i> = 32; <i>IQR</i> = 1	<i>U</i> = 2278, <i>p</i> <.001.	<i>Z</i> =-5.716; <i>r</i> = -0.39
Monosyllabic existing				
Multisyllabic existing	<i>Mdn</i> = 6; <i>IQR</i> = 2	<i>Mdn</i> = 7; <i>IQR</i> = 1	<i>U</i> = 3292, <i>p</i> =.001.	<i>Z</i> =-3.241; <i>r</i> = -0.22
Pseudowords	<i>Mdn</i> = 13; <i>IQR</i> = 3	<i>Mdn</i> = 14; <i>IQR</i> = 4	<i>U</i> = 3649, <i>p</i> =.038.	<i>Z</i> =-2.080; <i>r</i> = -0.14
Orthographic				
Existing words	<i>Mdn</i> = 6;	<i>Mdn</i> = 6;	<i>U</i> = 3727.5,	<i>Z</i> =-2.173;

	<i>IQR</i> = 2	<i>IQR</i> = 3	<i>p</i> =.030.	<i>r</i> = -0.15
Pseudo words	<i>Mdn</i> = 3; <i>IQR</i> = 1	<i>Mdn</i> = 3; <i>IQR</i> = 2	<i>U</i> = 3691, <i>p</i> =.040.	<i>Z</i> = -2.053; <i>r</i> =-0.14
<i>Morphological</i>	<i>Mdn</i> = 7; <i>IQR</i> = 5	<i>Mdn</i> = 12; <i>IQR</i> = 4	<i>U</i> = 2035, <i>p</i> <.001.	<i>Z</i> = -6.097; <i>r</i> =-0.41
<i>Etymological</i>	<i>Mdn</i> = 10; <i>IQR</i> = 7	<i>Mdn</i> = 15; <i>IQR</i> = 7	<i>U</i> = 2607, <i>p</i> <.001.	<i>Z</i> =-4.647; <i>r</i> = -0.31
<i>Syllabic</i>				
Existing words	<i>Mdn</i> = 6; <i>IQR</i> = 5	<i>Mdn</i> = 11.5; <i>IQR</i> = 3.75	<i>U</i> = 2062.50, <i>p</i> <.001.	<i>Z</i> =-6.035; <i>r</i> = -0.41
Easy pseudowords	<i>Mdn</i> = 1; <i>IQR</i> = 2	<i>Mdn</i> = 2; <i>IQR</i> = 2	<i>U</i> = 2554.50, <i>p</i> <.001.	<i>Z</i> =-4.993; <i>r</i> =-0.34
Complex pseudowords	<i>Mdn</i> = 3; <i>IQR</i> = 4	<i>Mdn</i> = 4.5; <i>IQR</i> = 42	<i>U</i> = 3374.50, <i>p</i> =.006.	<i>Z</i> =-2.769; <i>r</i> =-0.19
>1 strategy	<i>Mdn</i> = 3; <i>IQR</i> = 5	<i>Mdn</i> = 9; <i>IQR</i> = 6	<i>U</i> = 2268, <i>p</i> <.001.	<i>Z</i> =- 5.488; <i>r</i> = -0.37
Existing words	<i>Mdn</i> = 72; <i>IQR</i> = 23	<i>Mdn</i> = 91; <i>IQR</i> = 11.25	<i>U</i> = 2051.50, <i>p</i> <.001.	<i>Z</i> =-5.980; <i>r</i> = -0.41
Pseudowords	<i>Mdn</i> = 20; <i>IQR</i> = 5	<i>Mdn</i> = 21; <i>IQR</i> = 6	<i>U</i> = 3258.50, <i>p</i> =.002.	<i>Z</i> =-3.037; <i>r</i> = -0.21

In general the effect size for existing words was higher than for pseudo words, with complex pseudowords not providing more information than a classification of other spelling strategies.

Based on clinical scores on word-spelling tasks about 85% of the children with dyslexia could be detected. This was only possible for 29% of the children based on clinical scores on pseudoword-spelling tasks. Finally one out of twenty children with dyslexia didn't have spelling problems, revealing large individual differences in spelling skills of Dutch speaking children with dyslexia.

Conclusions

There was a medium effect size for morphological, syllabic, phonological, combined and etymological spelling strategies. The overall use of existing words resulted in medium effect sizes, whereas pseudo words resulted in small effect sizes. Based on clinical scores on the spelling of existing words about 85% of the children with dyslexia could be detected. This was only 29% based on clinical scores on the spelling of pseudowords. Finally one out of twenty children didn't have spelling problems although they had severe reading problems, which illustrated large individual differences between the Dutch speaking children with dyslexia. Our findings have practical implications. Clinicians are encouraged to be aware of the importance of the choice of spelling items in the detection of dyslexia. They should not neglect the results on existing monosyllabic spelling tasks, phonological, orthographic and

morphological spelling tasks and tests with existing words that have to be written based on a combination of strategies.

6. Development of Arithmetical skills and the Predictors of this Development.

Participants

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Discussant:

Christa Van Kraayenoord

Abstract

The aim of this symposium is to bring together research evidence on mathematical skill development and influencing factors. The individual papers present research conducted with different age groups. The papers discuss a developmental model of arithmetical concepts and its extension into higher number ranges (Germany), the pathways of development originating from different initial starting points of learning (Germany), as well as cognitive and linguistic skills as predictors of arithmetic understanding (Belgium). The studies are based on quantitative data and scales measuring mathematical and other cognitive components. The symposium aims to answer two research questions: How do arithmetic skills develop and what predicts the students' performances in this domain? The symposium has theoretical as well as practical significance. It brings together different aspects of research on mathematical development and investigates how to support students who struggle with arithmetical learning.

Development of arithmetical concepts in extended number range of the first three years of the primary school.

Antje Ehlert and Annemarie Fritz

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Mathematical competencies and arithmetical knowledge are gradually acquired and hierarchically built on one another (Fuson, 1988; Resnick, 1983). With regard to the arithmetical key competencies in pre-school and first grade age which build and mutually depend on one another, relatively reliable assumptions can be made (Case, 1992; Fritz et al., 2013; Fritz & Ricken, 2008; Fuson, 1988; Piaget, 1965; Resnick, 1983). Cognitive structures have to be developed step by step in order to acquire such arithmetical key competencies. Based on these cognitive structures children develop an understanding of arithmetical concepts which can be arranged hierarchically. All previously published articles on developing arithmetical concepts mainly focus on the smaller number range from 1-10 (e.g. Fritz & Ricken, 2008; Fritz et al., 2013; Fuson, 1988). Still relatively unknown is how those concepts are acquired by children in the extended number range. For this reason an exploratory study is planned to provide a first insight into whether the arithmetic concepts develop in the extended number range according to the theory by Fritz and Ricken (2008) and Fritz et al. (2013) and how the individual conceptual developments of complex number ranges are connected.

Therefore initially 60 children (31 girls) at the beginning of grade 2, resp. at the beginning of grade 3, were tested in an explorative study. All children completed a task to assess their arithmetical concepts (MARKO-D1, Fritz, Ehlert, Ricken, & Balzer, 2017). Additionally, they solved tasks within the larger number range derived from the MARKO-D1-test.

In doing so the number range was systematically extended by 15 items per number range extension. The tasks were designed close to the instructions and the completion of the original tasks of MARKO-D1 which is a follow-up test of MARKO-D (Test for developing arithmetical concepts at a pre-school age by Ricken, Fritz & Balzer, 2013). MARKO-D1 was developed based on the Item-Response-Theory (IRT). Likewise the tasks within the extended number range will be analyzed, compared and connected to the conceptual development approach by Fritz and Ricken (2008) and Fritz, Ehlert and Balzer (2013) based on IRT.

The IRT analysis of the three number range extensions shows that in all three modellings the items fulfill the quality criteria of a Rasch scaling. This means that ca. 86% of the items per number range extension have an infit-MNSQ-value between 0.8 and 1.2. 100% of the items of all three Rasch models have an infit-MNSQ-value between 0.7 and 1.3. Even in case of stricter regulations the quality criteria of the Rasch modeling are strongly complied with. The items are mainly arranged hierarchically in accordance to the main theoretical assumption. Although it is only a study with explorative character, a small sample size and only few items per number range extension, within a modelling we are successfully able to mark the theoretically based arithmetic concepts and show the hierarchical order of the items as well as the number range based development of these concepts. Assuming a successive acquisition of arithmetical concepts even in the respective number range extensions results show that depending on the number range extension the tasks of equal concepts vary in difficulty: the higher the number, the more difficult are the tasks of the same concept. Interpreting the content of the results it means that the concepts are acquired in a small number range first and are shifted in the extended number range later. Conversely, the successful acquisition of arithmetical concepts in the small number range is not automatically accompanied by a conceptual understanding in the extended number range. From this, relevant implications can

be derived for supporting of children with poor arithmetical performances and problems in understanding of arithmetical concepts.

Developmental assessment of numeracy learning.

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Assessment is a central activity in the work of teachers, performed through regular formal and informal monitoring of student performance via testing and observation. Pedagogical assessment, however, should reach beyond student marks and progress towards curriculum-driven goals. The application of a developmental approach has shown strong evidence (Woods & Griffin, 2013) that teachers can use individual learning progressions to better understand the abilities of their students, as well as to target their teaching to their students' needs. This study describes the construction of a formative assessment tool which aims to measure the development of numeracy in first-grade students in Germany. The tool consisted of items which were based on the development model of numerical concepts (Fritz, Ehlert, & Balzer, 2013), and drawn from an item pool developed during previous pilot studies.

This study addressed two main research questions. First, to what extent do the items fulfil the quality criteria of the Rasch model? Second, to what extent is it possible to track the students' numeracy development by means of the tool?

A longitudinal study with $N = 135$ first grade students (54.1% female) from six classes of two German primary schools was conducted. The student's numerical skills were assessed four weeks after the beginning of school using the MARKO-D test (pre-test) (Ricken, Fritz, & Balzer, 2013) and re-assessed at the end of the school year using the MARKO-D1 test (post-test) (Fritz, Ehlert, Ricken, & Balzer, 2017). The trial formative tool was applied over nine measurement points between the two summative assessments.

The trial formative assessment tool consisted of short tests (15 items each) in five different versions. The test versions were targeted to the students' numerical skills, i.e., each test was adapted to the students' performance on the previous test. The instructions were read aloud by trained Masters students from a local university whilst the first grade students attempted the given assessment tasks in their own test books.

The students' performance data was Rasch scaled using a simple dichotomous Rasch model. An item-fit analysis was conducted to evaluate the item quality. Person ability values were analysed through an analysis of variance (ANOVA) for repeated measures. These values were used to describe the progression of student learning in the whole group, with sub-groups compared against each other for differences in performance.

The item-fit analysis showed acceptable to very good Infit values between .65 and 1.25 with an overall item reliability of .87. A significant increase in performance over time could be reported ($F(8.80) = 34.4$, $p < .001$) with significant contrasts between the measurement points on the learning progression. There was no interaction effect between measurement time and gender. Different learning progressions were identified within groups who had varying levels of entry skills as assessed through the MARKO-D test (pre-test).

This study presents a step towards the construction of a developmental assessment tool which aims to support teachers in their professional decision-making supported by an empirically based learning progression.

Which variables predict arithmetic abilities in normal reading first bachelor students and their peers with dyslexia?

Marc Brysbaert and Maaïke Callens¹

¹Ghent University, Belgium

Several cognitive and linguistic skills have been found to predict arithmetic skills. Phonological awareness is the linguistic skill most related to performance on calculations. Individuals with developmental dyslexia are often found to have additional problems with arithmetic and in light of the Triple code model (Dehaene, Piazza, Pinel, & Cohen, 2003) this associated weakness is predicted based on the phonological problems in dyslexia. In this study we compared 100 first bachelor students with dyslexia with 100 control students on measures of mental calculation, intelligence, phonological awareness, rapid naming, verbal short term memory, speed of processing, working memory, and vocabulary. To diminish task variability, composite measures were created for each cognitive skill. Next, these were entered into a linear regression analysis together with possible interaction effects at the group level. Results showed that even high functioning individuals with dyslexia are prone to problems with mental calculation. The major difference between groups was the contribution of phonological awareness (PA) to fluency in arithmetic. For the control group PA was the most relevant predictor for all four operations, while speed of processing also contributed significant additional variance. For the group of individuals with dyslexia rapid naming (RAN) and SOP added unique variance when controlled for the other skills. It would seem that students with dyslexia are more likely to use procedural strategies due to problems with fact retrieval.

Round Tables Information

Round Table 1 : Executive Function across Age-Levels and Contexts: Impact on Academic Performance in Different Cultural Groups.

Lynn Meltzer, RESEARCHILD and ILD and Harvard Graduate School of Education
Lexington, U.S.A

Linda H. Mason, George Mason University Fairfax.

Julie Dunstan-Brewer, reFLEXions Initiative, c/o The Reading Clinic Pembroke, Bermuda.

Yveta Kovalčíková, University of Presov, Slovak Republic and Pedagogical University,
Cracow, Poland.

Abstract

In our 21st century technologically-oriented society, academic success is dependent on students' mastery of executive function processes, in particular, their ability to set goals, organize, prioritize, shift flexibly, access information from working memory, and self-monitor. This roundtable discussion will address the importance of these executive function processes across the grades in different cultures and communities. Presentations will emphasize research and clinical findings regarding the connections between metacognitive awareness, cognitive flexibility, self-regulation, and academic performance. Discussion will also address the cyclical relationship between executive function strategies, self-concept, persistence, and resilience as well as the implications for assessing and teaching students with learning and attention difficulties. Roundtable discussants will focus on the following questions:

- How do metacognitive awareness and executive function processes interconnect in students from preschool through high school?
- How do we promote metacognitive awareness by helping students to understand their strengths and weaknesses as well as their learning profiles?
- How do we teach students to use executive function strategies that promote flexible thinking and self-regulation in the context of academic and non-academic tasks?

Lynn Meltzer*, Kim Davis, and Ranjini Reddy

Flexible Thinking, Metacognition, and Effort: Promoting Academic Success in Students with Learning and Attention Difficulties.

Academic success in our 21st century technologically-oriented society is linked with students' self-understanding as well as their mastery of executive function processes, in particular, their ability to set goals, organize, prioritize, shift flexibly, access information from working memory, and self-monitor. This presentation will summarize the findings from our recent intervention studies evaluating the impact of metacognitive awareness, executive function, and effort on the academic performance of middle school students across the content areas (Meltzer, 2014, 2015; Meltzer, Basho, Reddy, & Kurkul, 2104). This intervention, known as the SMARTS Executive Function and Mentoring program, provides teachers with a systematic and explicit curriculum for fostering students' metacognitive awareness and teaching executive function strategies in the five core executive function areas.

Discussion will address selected findings from our intervention studies in which students with and without learning difficulties were taught executive function strategies as part of the SMARTS intervention. Our findings have shown that intervention students with learning and attention difficulties displayed increased effort, greater flexibility, and were more strategic in their schoolwork (Meltzer, Reddy, & Sayer, 2015; Meltzer, Davis, Reddy, 2018). These students also developed stronger metacognitive awareness and a deeper understanding of their strengths and weaknesses, a critical component of academic success. Students were more engaged and more invested in making the effort to use these executive function strategies in their classwork, homework, and long-term projects. Overall, increased metacognitive awareness and executive function processes promote positive academic self-concept and improved school performance, the foundations of academic and life success.

Julie Dunstan-Brewer and Susannah Cole.

Metacognition and Executive Function Processes in Early Childhood: Building the Foundations of Academic Success in Preschool

The metacognitive capacities of young children are often underestimated. This is compounded by the challenges that exist in fully understanding the early development of executive function processes. In particular, there is little consensus regarding the growth of young children's abilities to engage in goal-related processes such as self-monitoring and thinking flexibly. Given the evidence that promoting metacognition enhances school performance, direct instruction in preschool is likely to form a solid learning foundation for all children. This presentation will summarize the initial findings from our recent studies exploring metacognitive awareness, emerging executive function processes and academic readiness skills in children attending public preschools in Bermuda (Dunstan & Cole, in process).

We will open by illustrating young children's conceptions about the brain, as well as their interpretations of executive function language such as goals, plans and organization. Results from our intervention study will be used to examine the effectiveness of resources designed to assist early childhood educators to promote metacognition in the classroom. The connections and disconnections between preschoolers' metacognitive awareness and emergent executive function processes will also be presented. Challenges in assessing executive function processes will be highlighted by comparing children's task performance to rating scales completed by their parents/guardians. Despite these measurement difficulties, relationships between emerging executive function processes and early literacy and numeracy skills are evident, underscoring the role of executive function processes throughout the grades and across cultures. Discussion will focus on the importance of addressing metacognition in early childhood education as the foundation of academic success for all children.

Linda H. Mason.

Executive Function and Writing Fluency.

In many countries, students with learning disabilities do not perform well on writing tasks (e.g. National Center on Educational Statistics, 2012). These students' writing success is often related to difficulties in executive function, the attention and thought required for transcription and for planning, monitoring, evaluating, and regulating the writing process (Harris, Graham, Mason, McKeown, & Olinghouse, 2017). Initiatives, such as the Common Core State Standards Initiative (CCSS, 2013) in the United States (U.S.) and Common European Framework of Reference for Languages (2001) in Europe, mandate that all students, including those with learning disabilities, master genre specific writing across writing tasks with

fluency. In other words, students need to plan, write, and revise short and extended written products timely and with accuracy (Mason & Kubina, 2011). In three years of research study, we found that explicitly teaching students to set goals, self-evaluate, and graph writing performance resulted in significant improvements in writing fluency. In addition, students reported that self-monitoring (self-evaluation and graphing) was the most beneficial aspect in supporting their writing performance (e.g., Mason, Kubina, Kostewicz, Mong Cramer, & Datchuk, 2013). Results of our research found that implementation of intervention that addresses aspects of executive function for fluent writing, is critical.

Although the role of executive function in writing and the effectiveness of interventions addressing difficulties in executive function are well established, questions remain: (1) Assessment of executive function in writing is challenging. What characteristics of executive function are critical for students with learning disabilities as they learn to write fluently? How should these characteristics be assessed? (2) Some would argue that students' creativity is limited by the structured strategies in traditional executive function interventions for writing. Creativity can be further impacted by imposing time limits on students' writing. How can interventions be designed and implemented to alleviate these concerns? (3) Teachers are often not prepared to address students' executive function difficulties. How should teacher educators and researchers provide professional development for writing instruction to address teachers' knowledge gaps?

Iveta Kovalcikova.

Stimulation of Executive Function in Underperforming Pupils from the Roma Ethnic Group

This presentation will focus on a cognitive stimulation model designed for the specific educational needs of low-performing pupils from the Roma ethnic group in Slovakia. The presentation will highlight a recent study that was designed to evaluate the extent to which a domain-specific cognitive stimulation program can improve the quality of executive function processes in underperforming pupils. The sample consisted of 80 pupils, 40 in the experimental group and 40 in the control group. Subjects were sampled from the population of primary school underperforming pupils attending public schools whose socio-economic background was marked by signs of poverty and whose native language was not Slovak.

The intervention program consisted of a cognitive stimulation model which included SMARTS executive function strategies (Meltzer, 2018; Meltzer, Greschler, et al., 2015) as well as a peer mediation program. The major goals of the study were: (1) To develop evidence-based information about how executive function processes in low performing children can be improved through a domain specific intervention program; (2) To develop evidence-based outcomes which can be applied to other schools in Slovakia; (3) To design evidence-based information about measures that can be used to assess children's executive function processes.

This study was structured as a pre-post-test experimental vs. control-group design. Test measures were taken before and after the intervention in order to detect changes in children's cognitive and executive function processes. Quantitative data included measures of children's pre- and post-test performance in working memory, attention control, cognitive flexibility, cognitive planning, mathematical skills, and language skills. Qualitative data were collected through classroom observations (with video recordings) to provide descriptive information on metacognitive instructional practices and children's responses to the intervention. Findings, which are still being analyzed, will be presented during this Roundtable discussion.

Round Table 2 : Towards an International Understanding of Learning Disabilities: How are Learning Disabilities Defined and Operationalized in Your Country / Culture?

Michael Grosche¹, Matthias Grünke², David Scanlon³ and Georgios Sideridis⁴

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Abstract

The roundtables' goal is to initiate an ongoing collaboration with all IARLD members from around the globe. Definitions and operationalizations of LD differ not only within a given country but also between countries as well as between different scientific communities (e.g., medicine, special education, sociology) and for different populations (e.g., child/adolescent, adult, education, employment, social supports). Even though we might have at least a core consensus about how LD *should* be defined and operationalized (e.g., Scanlon, 2013; Speece & Shekitka, 2002), we still do not know how LD *are in fact* defined and operationalized between different countries (e.g., Grünke & Cavendish, 2016; Sideridis, 2007). Therefore, in our roundtable discussion, we first present theoretical criteria about how LD constructs around the globe could differ, then, to model the task for participants, discuss different LD constructs from the USA, Germany, & Greece, and analyze these constructs with our theoretical criteria. Then, the roundtable discussion will open for the audience, and everyone is invited to share their experiences and insights with the LD definitions and operationalizations used in their countries. We expect to initiate an ongoing collaboration with IARLD researchers, starting by working on a spreadsheet, and eventually come up with a paper discussing similarities and differences between the different LD concepts. International researchers could use this paper to define their international diverse samples more clearly and international comparable (also in order to get their manuscript published easier).

Round Table 3: Learning disabilities in adolescents and adults. How to assess and handle?

Petra Warreyn, Ghent University, Belgium.

Celestino Rodríguez, University of Oviedo, Spain.

Ellen Meersschaert Thomas More University Antwerp, Belgium.

Tal Rand-Koltin, Haifa University, Israel.

Tal Erez-Hod, Haifa University, Israel.

Abstract

Allmost one in every five first-year college students in the United States requires a remedial writing class and more than a half of new college students are unable to write a paper relatively free of errors. Most importantly, errors are not made in rarely used words; rather, basic errors in everyday words have become common in higher education. In addition also mathematics remains present as adolescent and adult in everyday life; each day we are confronted with it such as paying in the shop, baking a cake, travelling by train...

This round table will focus on the impact of poor reading, spelling and mathematical skills in adolescents and adults with dyscalculia and dyslexia. We discuss the tools to assess and to evaluate the criteria of learning disabilities in this population and look for approaches to enhance arithmetic and reading/spelling proficiency in adolescents and adults in different countries and settings.

Petra Warreyn

The importance of an adequate assessment also in adolescents and adults.

Although literacy receives a lot of research interest in the context of young students' emerging skills, there is less research on older students with learning disabilities and their reading and spelling skills. In addition although mathematical problems have serious consequences, this area has received little attention in adolescents and adults in research until recently. The importance of an accurate assessment in adolescents and adults will be discussed.

Celestino Rodríguez, Estrella Fernández, Rebeca Cerezo, Cristina Gómez, and José Carlos Núñez

What can we learn from literature?

In recent years, the number of students with learning disabilities who access to higher education has increased, so it is necessary to provide them with support and individual actions. In order to analyse the barriers that these students have to face, a research of the database Web of Science has been done using the following key words: *learning disabilities, higher education, university, barriers*. 23 papers were chosen, reviewed and compared under selected criteria. From this analysis we have known that, even though a great effort has been made in order to provide them with individual accommodations, students with learning disabilities still have to deal with different barriers in college. The short and long term effects of these results will be discussed.

Ellen Meersschaert

Effective support and coaching of young adults with dyslexia.

Young adults with dyslexia struggle with specific problems in their studies. They therefore need specific types of support. Only few studies focus on this target group and little attention has been paid to the broader context. The present study aimed to get an overview of the effective and ineffective aspects of support. The ultimate goal of this research is the development of an evidence-based support program.

The first study focused on the experiences of young adults with dyslexia and their network. To this aim, young adults with dyslexia, their parents, tutors and therapists took part in a semi-structured interview about the impact of dyslexia, effective and ineffective aspects of therapy and support, and experienced needs.

In a second study, we aimed to quantify these findings: what works for most young adults? A questionnaire was administered to 102 young adults with dyslexia (higher education).

The results revealed quite some effective (e.g. access to a contact person at school, tutoring) and ineffective (e.g. lack of communication, no evaluation of accommodations) aspects of support. The results also showed that, although the 'core' difficulties match those observed in the literature, other difficulties (e.g. reading comprehension) turned out to be more prominent in the experiences of the young adults. We discuss the results of both studies and the implementation in a support program for young adults with dyslexia. The program starts from the perceived needs of the young adult and integrates psycho-education with the implementation of compensatory strategies and tools into the individual study method.

Tal Rand-Koltin

The importance of non-cognitive measures.

This study illustrates that not only cognitive but also non-cognitive measures are important in adolescents. It sought to determine the contribution of mindset and effort beliefs to the Reading comprehension (RC) of adolescent students, and to explore the interrelations of these constructs with cognitive and meta-cognitive literacy skills. Seventy six 10th grade Hebrew speaking students completed reading comprehension texts, as well as literacy-related linguistic measures, and self-evaluation questionnaires. Results indicated that effort beliefs add a significant contribution to RC achievement, beyond vocabulary knowledge. In addition, among poor comprehenders (PC), effort beliefs increased success in RC through strategy use. Finally, PC students with high effort beliefs achieved higher RC grades compared to students with low effort beliefs. The results emphasize the importance of effort beliefs beyond cognitive literacy skills, in the RC of high school students.

Tal Erez-Hod

This study illustrates that a broad assessment might be indicated in adolescents. The contribution illustrates the relations between word and face processing in adults with and without dyslexia, mediated by a third component- general speed of processing (SOP). Twelve adults with dyslexia and nineteen adults with no learning disabilities underwent a series of reading tasks, along with general cognitive and facial processing measures. Compared to adults without learning disabilities, adults with dyslexia were found to be significantly lower in all reading measures. Moreover, they were significantly slower in all facial and general processing tasks, but just as accurate. These findings suggest that dyslexia in adults, is characterized by impairments not only in word processing, but also in general and facial processing. Theoretical and clinical implications of the findings will be discussed.

Round Table 4: The importance of spelling across languages.

Tessa Daffern University of Canberra, Bruce ACT, Australia.

Beatriz Vargas Dorneles, Universidade Federal do Rio Grande do Sul Porto Alegre Brazil.

Irit Bar-Kochva University of Cologne & the German Institute for Adult Education, Germany.

Kerstin Nobel University of Cologne (Germany).

Abstract

Writing has become increasingly fast-paced, exposed to global scrutiny, and has taken over from reading as the key competence of the literate person. Writing is socially and culturally situated, and demands application of a number of skills and processes across varying modes. Writing instruction must keep up with 21st century writing practices. So, what skills are important? Do correct spelling, grammar and punctuation remain critical to being a literate writer? In this Round Table the findings of writing/reading/planning in English, Portuguese and German are discussed.

Tessa Daffern

In this session, data from 829 primary school students are presented to illustrate the relationship between three language conventions (spelling, grammar and punctuation) and persuasive writing, as measured by the Australian *National Assessment Program for Literacy and Numeracy (NAPLAN) Language Conventions Test* and the *Writing Test*. Findings indicate that spelling, grammar and punctuation jointly predict persuasive writing, and that spelling is the main predictor. Participants are invited to join in a discussion on the implications of the research findings for the teaching of writing in the contemporary context.

Beatriz Vargas et al.

This session illustrates two studies describing Portuguese orthographic errors in children with ADHD. The first compared the orthographic performance of these students, from 3rd to 5th years, and a reference population, and the second compared the orthographic performance of students with ADHD, from 5th and 6th to 7th and 8th years using two different assessment instruments: dictation and text production. The results showed that the students with ADHD in the higher years presented better orthographic performance than the students in the first years and had worse performance than their peers. When we used two instruments, the ADHD students in the higher school years performed better in orthography than those in the lower years in dictation, but not in text production.

Irit Bar-Kochva

This session presents the effects of a morpheme-based training on literacy skills. Participants were 5th-6th graders, reading disabled native speakers of German. One group (n=26) underwent a morpheme-based training, designed to encourage fast morphological analysis in word-processing, and another group underwent a control training (n=25). Participants trained for 12 sessions, and were tested prior to training, immediately after training and one month thereafter. Only the group receiving the morpheme based training improved in measures of spelling, and showed effects of generalization to untrained material. Results of a word disruption task further suggest that the group receiving the morpheme-based training integrated morphological analysis into the process of word recognition. However, both groups similarly improved in measures of reading fluency and comprehension.

Kerstin Nobel

There is more than spelling. An area of writing that is particularly challenging for children

and youth with learning disabilities (LD) is planning. These students spent remarkably little time thinking of ideas, setting goals and organizing information (Rodríguez, Grünke, González-Castro, García, & Álvarez-García, 2015). Therefore, strategies that support them during writing and planning have a great chance to improve their writing. One very promising approach in this respect is called STOP & LIST (Graham & Harris, 2005). It is a prewriting strategy for children who have difficulties composing a text. In this session the results of a study using this approach is demonstrated. The participants of this study were four nine-year-old fourth graders with LD and specific difficulties in text production. For this study, a multiple-baseline across subjects design (AB) was used over the period of twelve schooldays. The improvement of four nine-year-olds' writing skills was measured each day of the study by capturing the number of Total Words Written (TWW) and the quality of the produced texts, using a writing rubric developed by Glaser (2004). While receiving instruction in using the STOP & LIST strategy, all four students performed at a significantly higher level than before the intervention.

Interactive Poster Session Information

READING AND READING DISABILITIES

A.1.

Reading networks in dyslexia: An fMRI study.

Karen E. Waldie, David Moreau, & Anna Wilson (University of Auckland, Auckland, NZ)

Abstract

Dyslexia is a developmental disorder characterized by reading and phonological learning difficulties, yet important questions remain regarding its underlying neural correlates. We conducted a multivariate partial least squares analysis of the neural networks used by 50 young adults with versus without dyslexia while performing a word-rhyming task. Although the overall reading network was largely similar in dyslexia and typical reading, it did not correlate with behavior in the same way in the two groups. There was a positive association between both right superior temporal gyrus and bilateral insula activation and reading performance in dyslexic readers but a negative correlation in typical readers. These findings emphasize the importance of understanding neural activation in the study of dyslexia and provide promising directions for remediation.

A.2.

Morphological processing and its relation to Reading: A study of Dutch-speaking children with dyslexia.

Jeremy M. Law (University of Glasgow, Scotland, UK), and **Pol Ghesquière** (KULeuven Belgium)

Abstract

This study examines the processing of derivational morphology and associations with literacy outcomes, phonological awareness and orthographic skills of 19 Dutch-speaking children with dyslexia and 55 age-matched typical reading control children in fifth grade. A masked priming experiment was used where semantic, orthographic and morphological relation between prime and target pairs were manipulated as part of a lexical decision task. Significant priming effects were found in each group. Children with dyslexia were found to only benefit from the morpho-semantic information while controls were found to be influenced by both morpho-orthographic and morpho-semantic information. Morpho-semantic priming effects were found to correlate with the performance on time-sensitive literacy measures of children with dyslexia while no relation was observed in controls.

A.3.

What are the cognitive-linguistic Skills that contribute to Reading Difficulties in Chinese and English among Chinese adolescents with dyslexia?

Kevin K.H. Chung (Education University of Hong Kong, New Territories, Hong Kong)

Abstract

This study investigated the influence of cognitive-linguistic skills on reading skills in Hong Kong Chinese adolescents with dyslexia who were learning English as a second language (L2). One hundred and sixteen adolescents of whom 58 were dyslexic were administered both Chinese (L1) and English (L2) tests in working memory, phonological awareness, morphological skills, word order and reading skills. Dyslexic readers performed worse than their typical peers in all the cognitive-linguistic and reading skills. Regression analyses showed that all the cognitive-linguistic skills were related to literacy skills in L2, whereas only morphological skills and word order skills were linked with literacy skills in L1. Further analyses indicated that the cognitive-linguistic skills in L1 contributed to reading in L2, suggesting cross-linguistic transfer between languages.

A.4.

Word, Face and General Processing Speed among Adults with and without Dyslexia

Tal Erez-Hod (Haifa University, Israel)

Abstract

This study investigated the relations between word and face processing in adults with and without dyslexia, mediated by a third component- general speed of processing (SOP). Twelve adults with dyslexia and nineteen adults with no learning disabilities underwent a series of reading tasks, along with general cognitive and facial processing measures. Compared to adults without learning disabilities, adults with dyslexia were found to be significantly lower in all reading measures. Moreover, they were significantly slower in all facial and general processing tasks, but just as accurate. These findings suggest that dyslexia in adults, is characterized by impairments not only in word processing, but also in general and facial processing. Theoretical and clinical implications of the findings will be discussed.

A.5.

Identifying early Learning Problems through a Person Based Analysis

Antoniou F (University of Athens, Greece), **Georgios D. Sideridis** (Harvard Medical School, Boston, USA), **Mouzaki, A.** (University of Crete, Rethymno, Greece), **Ralli, A.** (University of Athens, Greece), **Diamanti, V.** (University of Oslo, Norway), **and Papaioannou S.** (University of Thessaly, Volos, Greece)

Abstract

The purpose of the present study was to classify 4-7 years old children with and without suspected learning disabilities (LD) by use of a linear combination of variables including, listening comprehension, vocabulary knowledge, narrative skills, phonological awareness, and pragmatics. Participants were 82 pairs of matched peers for age, and gender. Participants were administered the Logometro a normed instrument delivered electronically. A person based analysis was utilized to assess the existence of subgroups. The results showed that gender was a significant predictor of latent class membership in predicting and differentiating the predominantly LD from the typical classes along with listening comprehension, morphological and narrative skills. The findings are significant onto showing complementary mechanisms engaged in the acquisition of language through the phonological or morphological pathways.

NON COGNITIVE COMPONENTS

B.1.

How varied data explain Strategy Learning and Outcomes.

David Scanlon (Lynch School of Education, Boston College, Chestnut Hill, MA 02474 USA)

Abstract

The goal of self-regulated learning is independent strategy usage. Students with Learning Disabilities (LD) are challenged to learn and use strategies. Measuring strategicness cannot only assess task outcomes. Building cases with multiple measures (Lichtinger & Kaplan, 2015) is useful for capturing the dimensions of strategicness. Multiple measures of metacognition, executive function, and self-regulation will be shared as part of a demonstration on how to build explanatory cases. The study involved 6 high school students with LD learning a content-area strategy. A mixed-methods embedded design with comparative case studies was employed.

B.2.

Divergent thinking in Italian students with and without Dyslexia.

Federica Stefanelli, Lucia Bigozzi , Diletta Marino, Christian Tarchi, Giuliana Pinto, and Renato Donfrancesco (University of Florence, Firenze, Italy)

Abstract

Several studies investigated the relationship between dyslexia and creativity, but the results are controversial and, usually, they are referred only to English participants. For this reason, it is impossible to generalize them to languages with a more transparent orthography. Here we want to verify if the Italian dyslexia children are more or less creative compared to their peers without learning disabilities. 190 children between 9 and 13 of age took part in the research. Of this 190 participants, 95 was dyslexic students while the other 95 was normal readers. The creativity of the sample was measured by the Creativity Assessment Packet test. The results showed that dyslexia children perform better than peers without learning disabilities in Originality, Processing and Titles indexes. No difference was found in fluidity and flexibility indexes.

B.3.

Social and emotional Learning for Students with LD: Issues and Challenges on Implementation in a multi-tiered Approach.

Holly Chen (University of Queensland, Brisbane, Australia)

Abstract

The most frequent comorbidity for students with learning difficulties and learning disabilities (LD) are social skill deficits. There is increasing recognition of teaching students social skills by incorporating social and emotional learning (SEL) instruction on a multi-tiered whole-school approach. This study identifies and addresses the issues and challenges related to the SEL implementation in a multi-tiered approach that support the SEL needs of students with LD. The finding revealed that a multi-tiered approach provides a promising implementation model for promoting students' social skills and thus improving academic skills and performance. The success of a multi-tiered approach needs coordinated effort from the school community and communications across the tiers. However, there is a lack of systemic effort in assessing students' social skill deficits (e.g., acquisition deficits, performance deficits or competing problem behaviours) and which target behaviour should be taught to meet the SEL needs of students with LD.

B.4.

The role of Resilience on Emotional Aspects and Reading Motivation in children with Dyslexia.

Enrica Donolato, and Irene C. Mammarella (University of Padova, Italy)

Abstract

Academic difficulties could predispose children with Reading Dyslexia (RD) to face emotional difficulties but few studies have considered aspects that could influence this relation. The present study explores the relation among emotional aspects, in particular resilience, reading motivation and strategies in children with RD. A sample of 33 children aged between 8 and 13 years with a clinical diagnosis of RD was tested using questionnaires about resilience, self-evaluation, general anxiety, reading motivation and strategies as well as with a reading comprehension task. Results showed that children with low resilience showed lower self-evaluation but also lower enjoyment and interest during reading activities, lower reading motivation and less functional strategies for reading comprehension. Clinical and educational implications will be discussed.

B.5.

The role of Effort Beliefs in the Reading Comprehension of high school Students.

Tal Rand Koltin, and Tami Katzir (Haifa University, Israel)

Abstract

This study sought to determine the contribution of mindset and effort beliefs to the Reading comprehension (RC) of adolescent students, and to explore the interrelations of these constructs with cognitive and meta-cognitive literacy skills. Seventy six 10th grade Hebrew speaking students completed reading comprehension texts, as well as literacy-related linguistic measures, and self-evaluation questionnaires. Results indicated that effort beliefs add a significant contribution to RC achievement, beyond vocabulary knowledge. In addition, among poor comprehenders (PC), effort beliefs increased success in RC through strategy use. Finally, PC students with high effort beliefs achieved higher RC grades compared to students with low effort beliefs. The results emphasize the importance of effort beliefs beyond cognitive literacy skills, in the RC of high school students.

B.6.

Correlated Study on School Adaptation among Self-efficacy, Interpersonal Relationship, Personal Trait and Academic Performance of Students with Learning Disabilities in G7-G9

Ho-Tsun Chung (Normal University, Taiwan)

This study was investigated school adaption on K7-9 students with learning disabilities among self-efficacy, interpersonal relationship, personal trait and academic performance. This study used three scales including self-efficacy scale, interpersonal relationship scale, personal trait scale for G7-G9 that were better reliability and validity. It also established Taiwan student's norm and used on corresponding relative position for explanation study results. The study randomly selected 40 schools to send a total of 500 questionnaires and scales. Reply rate was 83.4%, obtaining a total of 417 valid data to analysis by structure equation model. The results showed that under the control of academic performance, the individual characteristics of students with learning disabilities are highly correlated with their interpersonal relationships. Another finding of this study is that there is a moderate correlation between academic performance and self-efficacy for students with learning disability and that interpersonal relationships and self-efficacy collectively contribute significantly to school adaption.

CONTEXT - FAMILY AND SCHOOL

C.1.

Family levels of Influence for Youth with LD: examining the Effects of Monitoring, Nurturing and Rejecting Parental Behaviors on Youth Anxiety.

Breanna C. Lawrence (Brandon University, Brandon, Manitoba, Canada), **Gina L. Harrison**, and **Todd M. Milford** (University of Victoria, Victoria, BC, Canada)

Abstract

Research indicates that youth with learning disabilities (LD) experience elevated rates of mental health concerns. Drawing on a developmental relational system framework (Overton, 2015), the central aim of this study was to examine the complex and interactive effects of family factors on symptoms of anxiety among youth with LD. Using a representative sample of youth with LD from the Canadian National Longitudinal Survey of Children and Youth (NCLSCY, 2008) the associations between parental depressive symptoms, parenting behaviors (i.e., monitoring, nurturing and rejection), youth social-emotional abilities, and youth anxiety were examined. Findings indicated that the combination of these variables predicted approximately 35% of the variance in symptoms of anxiety. Parental monitoring and nurturance behaviours were most influential for middle school youth in reducing symptoms of anxiety.

C.2.

Is there a need for parental guidance in parents of children with learning disabilities: a comparison of parental beliefs and beliefs of speech therapists.

Sarah Volckaerts (Artevelde university college Belgium), and **Sandrine De Coster** (HoGent Belgium).

Abstract

Parent guidance in parents of children with learning disabilities is now a hot topic since the Belgian government has changed the criteria for obtaining financial support in the treatment of learning disabilities. The purpose of this study was to compare parental beliefs and beliefs of speech therapists about parental guidance. 51 parents and 40 speech therapists were questioned with two separate surveys. They were asked if parental guidance is necessary and what topics they wanted to cover. Parents were asked what short- and long-term effects they expected. A comparison of both surveys will give us some concrete guidelines for the development of a parental guidance program. Data are currently being collected but will be available at the moment of the conference.

C.3.

Quality Inclusion Indicators – Competences and Perspectives of Teachers.

Zrinjka Stancic, Suzana Pulec, Durdica Ivancic, and Klara Matejcic
(University of Zagreb, Croatia)

Abstract

After more than three decades of experience in implementing the educational inclusion of students with disabilities in Croatia, there are still no agreement on the indicators of the quality of an inclusive school. However, the ability to recognize, understand and respond properly to complex and subtle challenges is an extremely important characteristic of the professional competence of a quality teacher. This study was conducted in 40 primary schools in the city of Zagreb, which included 680 teachers. The Questionnaire on Quality of Inclusion Indicators - Teacher Perspectives was used. This questionnaire consists of three general variables: subject, classroom, total internship. The main part of the questionnaire consists of 112 statements (particles) deployed in 25 sub-areas of assessment through 6 hypothetical domains. Descriptive and inferential statistical methods were applied and factor analysis were conducted. Four factors could be distinguished: support in monitoring and evaluation and differentiated learning and teaching, resources for inclusive action, inclusive school ethos, a curriculum focused on student. Implications will be discussed.

C.4.

Teacher Knowledge and Attitudes towards Learning Disabilities : a cross-cultural Study in Ghana, Germany, and Spain

Celestino Rodríguez, Trinidad Garcia, Tonny Mensah*, Mathias Gruenke, Pablo Mónico, & Estrella Fernández**

*University of Oviedo (Spain), *University of Winneba (Ghana), **University of Koln (Germany)*

Abstract

A cross-cultural study was conducted, aimed at examining perceptions, knowledge and attitudes towards Learning Disabilities (LD) and Inclusion in teachers from Ghana, Germany and Spain. Results showed significant differences in self-confidence, and the amount of personal and material resources teachers receive from Administrations and schools, being Spanish teachers, in general, those who reported less levels; teachers showed adequate levels of knowledge on instructional strategies and students' characteristics, although those from Ghana showed significantly higher knowledge than the others in the last component; finally, teachers from the three countries differed in their attitudes towards inclusion, although teachers from Spain and Germany showed slightly better attitudes. They all agreed on the need for additional training as key aspect in this sense.

C.5.

Change in Attitudes and Confidence towards Teaching Children with specific Learning Disabilities after a short course Training

Issarapa Chunsuwan (Thammasat University Klongluang, Pathumthani, Thailand)

Abstract

In Thailand many teachers assigned to teach children with Specific Learning Disabilities (SLD) have not been adequately prepared. Our research measured the effectiveness of short course training on SLD on changing attitudes and confidence in their teaching. The training was provided by multidisciplinary medical specialists in speech and occupational therapy, psychology, child psychiatry and pediatric development. In the study 49 teachers affiliated with the Provincial Special Education Center attended the training and completed pre-and post-training questionnaires. They teach in parallel and/or resource classrooms. Half of teachers graduated with a degree in education; only 18% were trained in SLD in college. Questionnaires on attitudes and confidence towards teaching children with SLD revealed significant positive changes post training.

COMORBIDITY

D.1.

Comparison between two Continuous Performance Tests for identifying ADHD: traditional CPT vs. virtual reality CPT.

Paloma Gonzalez-Castro, Debora Areces, Trinidad Garcia, Celestino Rodriguez, and Marisol Cueli (University of Oviedo Spain)

Abstract

This study aims to compare the explanatory power of attentional variables provided by Aula Nesplora test with variables provided by TOVA test for identifying the ADHD presentations. A total of 338 children aged between 6 and 16 years ($M = 10.84$, $SD = 3.01$) participated in the study: 31.95% correspond to the inattentive presentation, 15.38% to the impulsive-hyperactive presentation, 22.78% to the combined presentation, and the remaining 29.88% correspond to children without ADHD. The results indicated that Aula Nesplora predicts better than TOVA the ADHD presentation as well as the group without ADHD. This finding suggest the advantages of using virtual reality in the ADHD diagnosis, precisely because it allows comparing control and ADHD groups in a realistic environment.

D.2.

Assessing narrative Skills of young Children with ADHD, Autisme Spectrum Disorders and Typically Developing Children.

Mouzaki, A. (University of Crete, Rethymno, Greece), **Fiorentzi, K.** (University of Crete, Rethymno, Greece), **Antoniou, F.** (National & Kapodistrian University of Athens, Athens, Greece), **Ralli, A.,M.** (National & Kapodistrian University of Athens, Athens, Greece), **Diamanti, V.** (University of Oslo, Oslo, Norway), and **Papaioannou S.** (University of Thessaly, Volos, Greece)

Abstract

Detection of inadequate language development is a very promising way to identify children belonging in high risk groups for language disorders and learning difficulties and to assist them in overcoming any language difficulties through early intervention. Narrative skill development is of particular value because it enables us to examine linguistic but also cognitive and social aspects of child development. Purpose of this study was to investigate the acquisition of narrative skills in typical four, five, and six-year-old children, in order to better understand language development and risk characteristics, and to assess narrative skills in children with Autism Spectrum Disorder and Attention Deficit Hyperactivity compared to a group of typically developing children of the same age and gender for each group.

KINDERGARTEN

E.1.

Do Executive Functions contribute to the Academic Achievement of South African Kindergarten Learners? A preliminary Study.

Lara Ragpot (University of Johannesburg, Soweto, Gauteng, South Africa), **Meghann Collins**, (University of Johannesburg, South Africa), **Tanya Lamb**, (University of Johannesburg, South Africa), and **Caroline Fitzpatrick** (Université Sainte-Anne, Church Point, NS, Canada)

Abstract

South African children's academic achievement is a major concern, resulting in nation-wide efforts to identify intervention strategies that address low performance. This study investigated the association between behavioural executive functions (EF) and early achievement in a group of kindergarten learners ($n=46$; mean age = 70.8 months). Teachers assessed behavioural manifestations of EF. Academic outcomes were assessed using student report card grades in numeracy and literacy. Math-reasoning was directly assessed with a subtest from the Wechsler Individual Achievement Test (Wechsler, 2005). Multiple regressions revealed that EF were positively related to literacy and numeracy report card results ($b = .37, <.01$) and ($b = .32, <.01$), after controlling for math skills and demographic characteristics. Math skills contributed significantly to numeracy ($b = .26, <.05$) and marginally to literacy ($b = .25, =.053$). The study highlights possibilities for further research of kindergartners that could optimise their learning readiness.

E.2.

Digital reading miles as a way to improve G1 children's reading level.

Maria T. Sikkema-de Jong, **Deborah N. van Duijn**, and **Joost R. van Ginkel** (Leiden University the Netherlands)

Abstract

Over a school year we experimentally tested whether reading e-books with or without highlighting text would add to beginning readers' reading skills. It was the teachers who implemented the e-books in their daily curriculum. E-books contain verbal text in addition to the onscreen text. This allows beginning readers to read books independently for which they would otherwise need the help of an adult. Struggling readers reading fluency benefited from reading e-books but only when text was highlighted. On spelling and word chains, the e-book groups scored similar as the control group who did the regular reading exercises without e-books. We conclude that e-books can have a surplus value when they are used to provide *extra* reading miles instead of displacing other reading exercises.

E.3.

Effects of the STOP and LIST Strategy on the Writing Performance of Students with Learning Disabilities .

Matthias Grünke, Kerstin Nobel, and Janine Bracht (University of Cologne Germany)

Abstract

In this study, we tested the effectiveness of an easy-to-implement strategy (STOP & LIST), designed to improve writing planning skills in children with learning disabilities (LD). Its aim was to help students to set appropriate goals for the writing task, generate possible ideas and sequence them before starting the composition process. The participants of this study were four nine-year-old fourth graders with LD and specific difficulties in text production. During a baseline period (Phase A, 5-7 probes) and an intervention phase (Phase B, 5-7 probes), they wrote one story each day in response to different writing prompts. Quantitative and qualitative measures were used. While receiving instruction in using the STOP & LIST strategy, all four students performed at a significantly higher level than before the intervention.

MATHEMATICS / LEARNING DISABILITIES

F.1.

Early numerical Abilities Kindergarten Children: Training semantic and pre-syntactic skills.

Cristina Semeraro (University of Bari “Aldo Moro” Italy), **Maria Pietronilla Penna**, (University of Cagliari Italy), and **Daniela Lucangeli** (University of Padua Italy)

Abstract

The aim of this study was to verify the efficacy of a training early numerical skills in forty-nine Italian 4-year-old kindergarteners. The participants were randomly assigned to the training group or control group: children in the training group worked about semantic and pre-syntactic trials, whereas children in the control group followed the ministerial teaching programs focused on lexical skills. The training was respectively carried out by the curricular teacher; she received a specific training in order to use the cognitive programmers with her pupils. The training and the control activity lasted for 8 weeks, there were usually 2 sessions for week, and each session lasted approximately 45 min. The training group showed improvements in semantic, pre-syntactic, counting and lexical subscales whereas the control group showed improvements, albeit small, simply in counting and lexical subscales of the numerical assessment battery. Trainings efficacy suggests that the effect size of the trainings enhancing numerical skills since the early childhood highlights the outcomes in terms of improvements of specific aspects of mathematics achievements (e.g., number sense, counting sequences, quantity comparisons). These findings stress the importance of performing activities designed to train semantic and pre-syntactic abilities in the early prevention of learning difficulties during preschool years.

F.2.

Influence of initial Mathematical Competences in the Effectiveness of IDR Intervention for Learning Disabilities.

Paloma Gonzalez-Castro, **Marisol Cueli**, **Celestino Rodriguez**, **Debora Areces**, and **Tridad Garcia** (University of Oviedo Spain)

Abstract

The present study attempts to analyze the influence of initial levels of mathematics competency with respect to the benefits of a specific intervention known as the Integrated Dynamic Representation (IDR). Participants were 288 students (aged 6-8 years) who were divided according to their levels of mathematics competency (low-medium-high). Students were assigned to the Experimental Group (students who received the IDR intervention) and Control Group (students who followed the traditional instructional methods). All participants completed the Test of Early Mathematics Abilities (TEMA-3). Although all the three competency levels of the EG improved, the progression was different for each level. Results showed that students with low competency level improved substantially more than the students with medium and/or high baseline competency level.

F.3.

Effects of an Intervention to foster Part-Whole Understanding in Elementary School Students with Learning Disabilities.

Karolina Urton, Jennifer Karnes, and Mathias Grünke (University of Cologne Germany)

Abstract

The purpose of this study was to evaluate the efficacy of a simple training to enhance comprehension of part-whole relationships in fourth graders with learning disabilities (LD). A multiple baseline across ten participants and changing criterion design was used to evaluate the benefits of the intervention. At the end of the treatment, the performance of all students had significantly increased when compared to the initial status quo. The implications and limitations of the findings will be discussed.

F.4.

Diagnostics of Dyscalculia in Adolescents: the Arithmetic Skills.

Ellen Meersschaert, and Ilse Smits (Thomas More University of Applied Sciences, Antwerp, Belgium)

Abstract

In the present study we present the results of a large sample of 3th graders, the reference group. Results showed that students obtained a mean total score of 62.06 (maximum = 120) with a SD of 19.51 (5.8-102.9). We observed a significant difference between the total score of participants without (62.96) and with **dyscalculia** (36.45) ($F=18.469, p < .001$). The total score, but also on the subscores fact knowledge, procedural knowledge, conceptual knowledge, integration of the specific arithmetic skills and additional arithmetic skills were investigated. Differences between the **educational levels** of the three groups were significant ($F= 47.704, p < .001$), both on the total score and the subscores. There were no significant differences between **boys and girls** on the total score ($F=2.197, p=.139$). There were no significant interaction effects. The implications of the correlations between self-evaluation and arithmetic achievement will be discussed.

COLLEGE AND ADULT TRANSITION

G.1.

Learning Disabilities in Higher Education : a new Challenge for Research and Institutions.

Celestino Rodriguez, Estrella Fernandez, Rebeca Cerezo, Cristina Gomez, and Jose Carlos Nunez (University of Oviedo Spain)

Abstract

In recent years, the number of students with learning disabilities who access to higher education has increased, so it is necessary to provide them with support and individual actions. In order to analyse the barriers that these students have to face, a research of the database Web of Science has been done using the following key words: *learning disabilities, higher education, university, barriers*. For this study 23 papers were chosen, reviewed and compared under selected criteria. From this analysis we have known that, even though a great effort has been made in order to provide them with individual accommodations, students with learning disabilities still have to deal with different barriers in college. The short and long term effects of these results are discussed.

G.2.

Adaptations of Curriculum and Instruction for middle school Students with Learning Disabilities in Taiwan.

Hsuan-Hui Wang (National Taiwan Normal University Taiwan), **Yen-Nan Chueh** (Special Education Resource Center Taipei City Taiwan), and **Li-Yu Hung** (National Taiwan Normal University)

Abstract

The study aimed to explore adaptations of curriculum and instruction for students with learning disabilities (SWLD) in middle schools in Taipei. A teacher questionnaire was conducted to survey relative adaptations SWLD accepted. Subtype effect between ADD, DCD, SLD, RD and dyslexia was explored by chi-square test. 74.8% of SWLD accepted resource room curriculum. (1) Students with ADD accepted less resource room curriculum than others. (2) Students with developmental LD accepted more basic skills training than students with academic LD. Our results revealed 97.7% of SWLD accepted adaptive instructions. (1) Students with SLD accepted more material content adjustments. (2) More reading comprehension strategies were integrated in instructions for students with SLD & RD than dyslexia. More self-evaluation strategies were provided for students with ADD than SLD & RD. (3) Students with DCD accepted more time arrangement in tasks and tests than others. Implications for practice and further research are recommended.

G.3.

Personal Experiences and School Adjustment of University and College Students with Learning Disabilities in Taiwan.

Chiung-Chu Wang (National Kaoshiung Normal University, Taiwan)

Abstract

In Taiwan, more and more students with Learning Disabilities (LD) have attended universities and colleges since 10 years ago because of the dramatic change in entrance exam policy. Students with special needs are allowed to enter universities and colleges via a special pathway with less competition. However, is the preferential policy really appropriate for students with LD? How do students with LD feel in school? The purposes of this study were to investigate personal experiences and school adjustment of undergraduates with LD. The data collection method included interviews and questionnaire investigation. Results indicated that family's SES, time of identification, self-concept, and personality traits had significant relationship with school adjustment. LD students felt satisfied with their academic performance and personal relationship in school.