Spørsmål

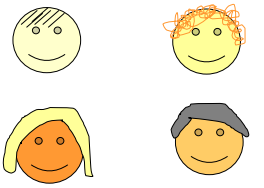
Kan vi finne

1. **tidlige risiko-faktorer**
2. tidlig effekt av trening?

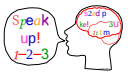
Prosjektets to deler

- 5 - 8 år:
- Effekt av trening

- **5 -12 år:**
- **Hvem utviklet dysleksi?**



Is it possible to identify dyslexia at a preliteracy phase?



- ”Wait and see”
- ”Could be stigmatising”
- ”His father was like this, too”
- ”She just doesn’t pay attention”

- No, don’t!
- Better to fail in school?
- Yes, it runs in families
- Have you asked yourselves why?

Ti forskjellige publikasjoner om dysleksi - du vil møte ti forskjellige definisjoner!

- Hvorfor?
  - Flere årsakskjeder, - ikke bare én, et spektrum (Pennington & Bishop, 2009)
- BDA sin definisjon
- Hvordan skal en greie å få best innsikt?
  - Longitudinelle studier (Dehaene, 2009; Goswami, 2003)

British Dyslexia Association sin definisjon av dysleksi:

- affects the **development of literacy and language related skills**.
- **present at birth** and to be **lifelong** in its effects.
- characterised by difficulties with
  - **phonological processing**
  - **rapid naming**
  - **working memory**
  - **processing speed**
  - **automatic development of skills** that may not match up to an individual's other cognitive abilities.
- It tends to be **resistant** to conventional teaching methods, but its effects can be **mitigated** by appropriately specific intervention, including the application of information technology and supportive counselling.

http://www.bdadyslexia.org.uk/about-dyslexia/further-information/dyslexia-research-information-

Longitudinelle studier

(Dahaene, 2009; Goswami, 2008)

- Alle longitudinelle studier som har tatt utgangspunkt i førskolebarn og som til nå er publiserte er baaserte på genetikk/arvelighet som en tidlig risikofaktor

(H. Lyytinen et al., 2004).

- Ikke alle barn av dyslektiske foreldre får dysleksi
- Ikke alle dyslektiske barn har dysleksi i den nærmeste familien
- Derfor er det nødvendig å definere andre risikofaktorer i tillegg til de genetiske
- De etablerte teoriene om dysleksi peker mot flere testbare risikofaktorer

Longitudinelle studier eneste farbare vei, men hvordan?

Medfødt vanske

- forekomst ca 5 – 10%

Genotype:

- Barn av foreldre med dysleksi
  - kan følges fra fødsel av
  - mellom 30-70% har ikke ”arvet” dysleksi

Fenotype:

- Personer med typiske kjennetegn på dysleksi
  - når kan vi ”se” disse kjennetegnene?
  - vente å se, eller ta tidlige tegn på alvor?

Genotype + fenotype = endofenotype

Dyslexia…

Congenial developmental disorder
- affecting aspects of language
- prevalence:
  - 5-10% (Siegel, 2006)
  - 5-17% (Shaywitz & Shaywitz, 2005)

Main focus over the last decades:
- **phonological processing** problems
- the dyslexia **spectrum**
  (Vellutino, Fletcher, Snowling, & Scanlon, 2004)

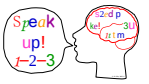
Benchmark causal and contributing factors
- heredity (Grigorenko et al. 1997)
- impaired languge development (Korkman & Häkkinen-Rihu 1994; Bishop 1997; Tallal 2000)
- the magno-cellular system (Stein & Walsh, 1997)
- abnormal laterality (Geschwind 1979; Galaburda 1993)
- abnormal motor control (Nicolson & Fawcett, 1999)

In addition: general health

Fox, S. E., Levitt, P., & Nelson III, C. A. (2010). How the Timing and Quality of Early Experiences Influence the Development of Brain Architecture. *Child Development, 81*(1), 28-40.

…cannot be explained by one factor alone
(Snowling, 2008; Pennington & Bishop, 2009)

Utfordringer



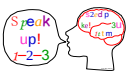
- LI, **RD,** and SSD are **complex multifactorial disorders**, not only in terms of their genetic and environmental etiology, but also in terms of their cognitive underpinnings.
- Each disorder appears to **arise as the consequence of a specific constellation of underlying deficits**.
- Each individual deficit may be common in the general population and **may only assume clinical significance when combined with another deficit**.

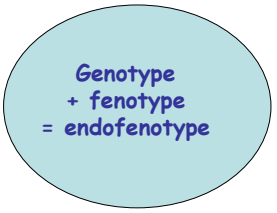
Pennington, B. F., & Bishop, D. V. M. (2009). Relations Among Speech, Language, and Reading Disorders. *Annual Review of Psychology, 60*, 283-306.

- It is estimated that to identify all of the weakest **10%** of beginning readers, current measures would identify **20%** of children as being at high risk.
- Because effective prevention is resource-demanding, **more accurate identification** of at-risk children would be valuable.

Gabrieli, J. D. E. (2009). Dyslexia: A New Synergy Between Education and Cognitive Neuroscience. *Science, 325*, 280-283.

Hypotese

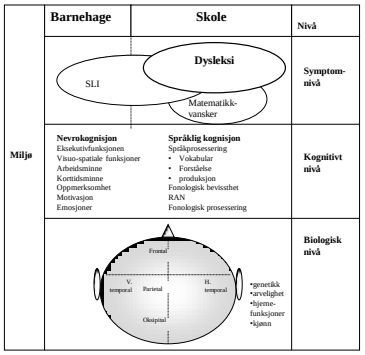




- Endofene kjennetegn på dysleksi når barna er 5 år predikerer dysleksi når barna er 11 år (6.klasse)
  - Reliabilitet
  - Validitet

Hvordan?

1. Ved å stille kvalifiserte spørsmål
   - basert på evidens
   - til de nærmeste omsorgspersoner
   - på en forståelig måte
2. Ved å følge barna i en årrekke ved
   - kvalifisert testing
   - basert på evidens



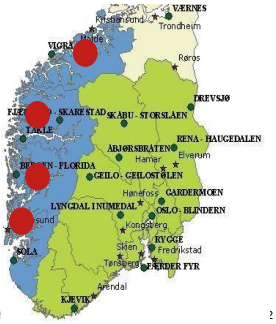
Symptoms at behavioural/symptomatic and neuro-cognitive levels, and illustration of the cortical lobes at the biological level (Helland 2002).

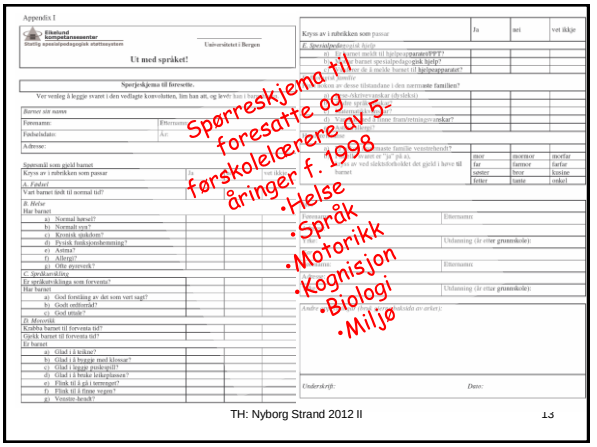
Morton, J., & Frith, U. (1995). Causal modeling: A structural approach to developmental psychopathology. In D. J. C. Dante Cicchetti (Ed.), Developmental psychopathology. Vol. 1: Theory and methods. Wiley series on personality processes. (pp. 357-390): John Wiley & Sons, New York, NY, US.

Deltakere i prosjektet, 2003-2014

- **4 fylker**
  - 4 kommuner
    - 9 barnehager
    - 11 skoler
      - 2 by
        - » 1 bokmål, 1 nynorsk
      - 2 land
        - » 1 nynorsk, 1 bokmål
- **N, 5–åringer = 120**

- Ca 16 PP-ansatte
- Ca 40 lærere
- Ca 20 masterstudenter
- Ca 13 forskere

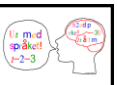




The Risk Index (RI-5)

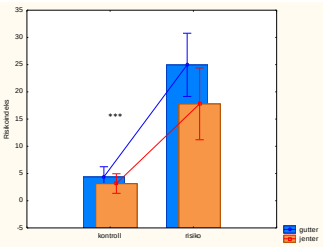
- 6 domains: soma, laterality, motor, language, spec. ed., heredity
- Filled out by parents and preschool teachers
- Sum scores averaged (parents, teachers)
- RI-5 formula:
  - Summed scores/(6 x 2) x 100
- Mean 9.96, SD 10.07 (range 0 – 47.5)
- Risk group: upper quartile of the RI-5
  - skewed gender profile, with few girls

Utvalgsprosedyre 2003



Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal
Haugesund	Kvinnherad	Førde	Fræna
2 barnehager	2 barnehager	2 barnehager	2 barnehage
3 skoler	3 skoler	2 skoler	2 skolerr
Til sammen 120 barn født i 1998			
109 foresatte takket ja til å delta			
Spørreskjema (RI-5) til alle foresatte og førskole			
105 barn inkludert			
26 risiko; 26 kontroll			
Estimert: ca 10% vil utvikle dysleksi			

Utvalg



Risiko-indeks, barna er 5 år

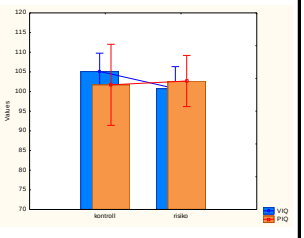
Inklusjonskriterier:
1. Norsk som 1.språk
2. Ingen
   - syndrom
   - påviste nevrologiske avvik
   - store sanseavvik
   - psykisk utviklingshemning

Bakgrunnsdata

Utvalg

- 5-8 år
  - N = 52/49
    - gutter = jenter

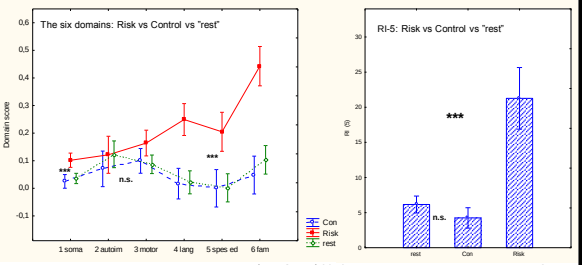
WPPSI, 5 år: n.s.

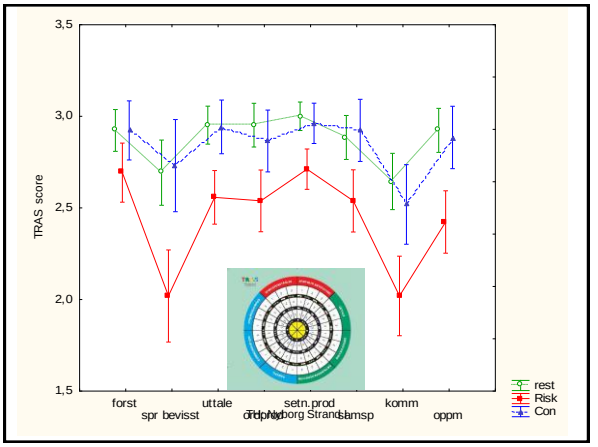


The RI-5

N = 109 Parents vs preschool teachers,

Cronbach's alpha .781; **Correlations** .713; **Split-half reliability** .833





Project design

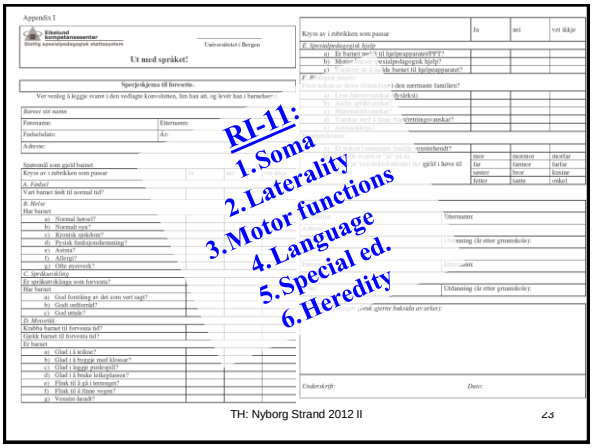
		Spring	Fall	
2003	Preschool Age 5	·Start/questionnaire	·Screening	·Meetings
2004	1st grade Age 6	·Training I a) b) ·fMRI	·Screening	·Meetings ·Conferences
2005	2nd grade Age 7	·Training II a) b)	·Screening	·Meetings, ·Conferences
2006	3rd grade Age 8	·Training III a) b)	·Screening	·Meetings ·Conferences ·Publications
2007		·Reports ·fMRI ·The Balance lab	·Reports ·Master-theses	·Meetings ·Conference ·Publications
2008		Reports	·Mastertheses	·Publications
2009 - 2014	6th grade Age 11-12	·fMRI	·Questionnaire ·Screening	·Meetings ·Conferences ·Publications

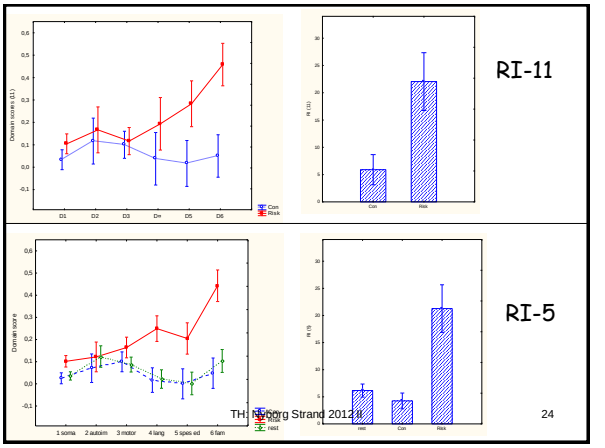
Testing på PPT

	Tidsbruk	2003	2004	2005	2006
TRAS (screening)		x	-	-	-
WPPSI, WISC-III	2 t	x	-	-	x
BPVS	15 min.	x	x	x	x
TROG	15 min.	x	x	x	x
Ringsted/Modellsetninger	15 min.	x	x	-	-
Fonologisk bevissthet, Ringsted	5 min.	x	x	-	-
Stroop Color Word Test	1-5 min.	x	x	x	x
Rey Osterieth Complex Figure Test	10 min.	-	x	x	-
Lateralitetstester, B-P, BRLDT	15 min.	x	x	x	x
Dikotisk lytting	10 min.	x	x	x	x
Tallhukommelse(WISC-R)	5 min.	x	x	x	-
Våletesten	15 min.	-	-	x	-
Leseprøver	15 min.	x	x	x	x
Orddiktat	15 min.	-	x	x	x
Engelsk 1	5 min.	-	x	x	x
Engelsk 2	5 min.	-	x	x	x
Sum, individuell testing		**3t 20 min.**	**2t 15 min.**	**2t 25 min.**	**3t 35 min**

Correlations (*: p < .05; **: p < .01)

Age	Test	Risk Index
6	Phonological awareness (Ringeriksmaterialet, sum)	*
6	fMRI (The Bergen fMRI Reading Test)	*
7	Language comprehension (TROG)	*
7	Visuo-spatial skills (RCFT, recall)	**
7	Verbal learning (Våletesten, sum)	**
8	Working memory (Digit span)	**
8.	Word reading (STAS)	**
8.	Word spelling (STAS)	**





Measures of reliability

Measures: RI questionnaire	N	Inter-rater Correlations
Parents (5) vs preschool teachers (5)	109	.713
Parents (5) vs preschool teachers (5)	49	.743
Parents (5) vs parents (11)	41	.843
Preschool teachers (5) vs parents (11)	41	.703
Risk Index (5) vs parents (11)	41	.689

Age 11: finding the low scorers

Regrouping according to literacy skills:

1. Nonword reading (NWR)
2. Word reading (WR)
3. Word spelling (WS)
4. Text reading (TR)

The low 25%

- Upper = 0 below 25%
- Middle = 1 below 25%
- **Low = 2-4 below 25%**

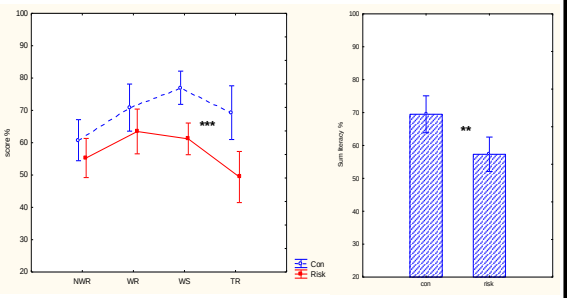
Findings

Of 109 were 13 identified as "Low" scorers

- **= 11.9%**

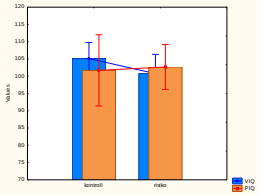
CONCLUSION: "Low" = dyslexia

Measures of validity, age 11

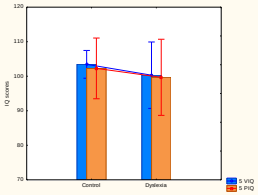


WPPSI, 5 år

Kontroll - risiko



Typisk - dysleksi



RI-5, N = 42

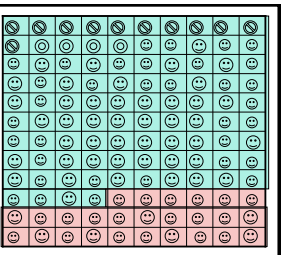
Condition: dyslexia

Sensitivity = .85

Specificity = .62

	Dys	No Dys
Risk	11	11
Con	2	18

2 x 2 Chi² = 7.84, p <.01



Heredity

Condition: dyslexia

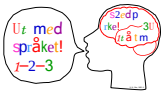
Sensitivity = .62

Specificity = .66

	Dys	No Dys
Here	8	10
No here	5	19

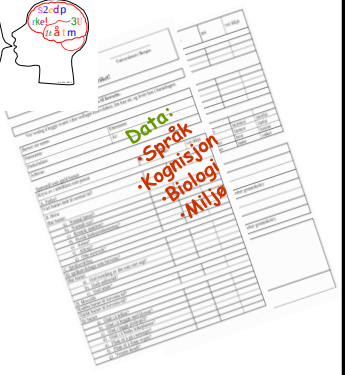
2 x 2 Chi² = 2.68, p = .10

Svar



Har vi funnet

1. **tidlige risiko-faktorer?**
   - **Svar: Ja**
   - **effekt av trening?**
   - **Svar: antagelig**



DYSLEXIA
Published online in Wiley Online Library
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Predicting Dyslexia at Age 11 from a Risk Index Questionnaire at Age 5

Turid Helland[1]*, Elena Plante[2] and Kenneth Hugdahl[1,3]

[1]Department of Biological and Medical Psychology, University of Bergen, Norway
[2]Department of Speech, Language, and Hearing Sciences, University of Arizona, USA
[3]Division of Psychiatry, Haukeland University Hospital, Bergen, Norway

This study focused on predicting dyslexia in children ahead of formal literacy training. Because dyslexia is a constitutional impairment, risk factors should be seen in preschool. It was hypothesized that data gathered at age 5 using questions targeting the dyslexia endophenotype should be reliable and valid predictors of dyslexia at age 11. A questionnaire was given to caretakers of 120 5-year-old children, and a risk index score was calculated based on questions regarding health, laterality, motor skills, language, special needs education and heredity. An at-risk group (n = 25) and matched controls (n = 24) were followed until age 11, when a similar questionnaire and literacy tests were administered to the children who participated in the follow-up study (22 at risk and 20 control). Half of the at-risk children and two of the control children at age 5 were identified as having dyslexia at age 11 (8 girls and 5 boys). It is concluded that it is possible to identify children at the age of 5 who will have dyslexia at the age of 11 through a questionnaire approach. Copyright © 2011 John Wiley & Sons, Ltd.

Keywords: at risk; dyslexia; preschoolers; school children; questionnaire screening

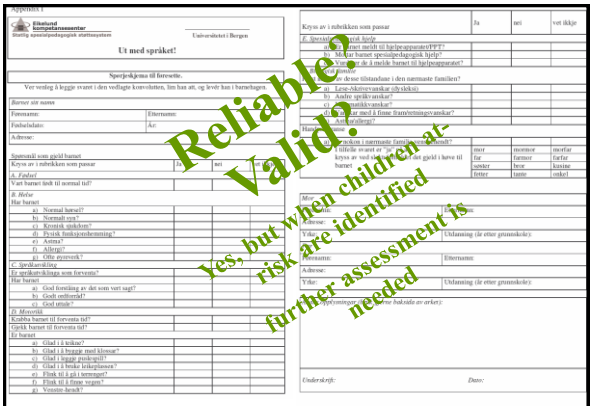
Table 5. Predictive model of 1000 randomly sampled 5-year-old preschoolers

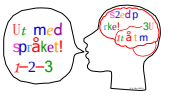
True positive 124 (12.38%)	False positive 29 (2.86%)
False negative 19 (1.9%)	True negative 829 (82.86%)

Clinical implications of the results point to a simple method of finding preschool children at risk of developmental dyslexia. If the low range RI-5 scores (17.01 for boys and 9.72 for girls) are used in a clinical situation, one should be especially aware of children with RI-5 scores in the range between these two cut-offs to avoid false negatives. In a research setting, it would be of interest to use the lowest range scores of the defined dyslexia group as cut-off scores because these scores would reduce the number of false positives and give a more accurate identification rate closer to the 10% as suggested by Gabrieli (2009). Table 5 shows the percent of children at age 5 who would be identified as having dyslexia through a general screening with this instrument, the percentage identified as typical, as well the percent of false positive and false negative identifications.

This would yield a sensitivity measure of the RI-5 of .87 and a specificity measure of .97. Given the cost in time to administer the survey, these numbers suggest that the RI-5 could be a relatively efficient method of identifying children who would benefit additional assistance to develop reading skills.

In conclusion, this calculation is promising as to early identification of children at risk of dyslexia. Finding these children ahead of school age could open for interventions during the period when children are expected to be most sensitive to literacy training. However, replication studies on the RI-5 index and gender profiles in dyslexia research are necessary to validate the findings presented in this paper.





Noen videre spekulasjoner…

Kjønnsforskjeller???

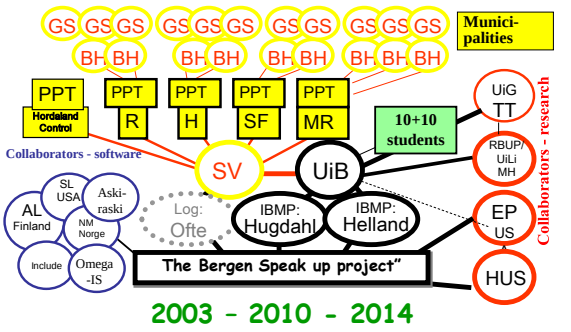
	Ikke dysleksi	Dysleksi
Gutter	16	5
Jenter	13	8
	29	13

Further research

- Focus
  - on the RI-5
  - on girls
  - on gender and heredity
  - on testing of identified at-risk children
  - early training

Gabrieli, J. D. E. (2009). Dyslexia: A New Synergy Between Education and Cognitive Neuroscience. *Science, 325*, 280-283.

Thanks to national and international collaborators



Publications

International

1. Helland, T., Ofte, S. H., & Hugdahl, K. (2006). "Speak up!" A longitudinal study of children at-risk of developing language, reading, writing, and mathematics impairment In A. E. Asbjornsen (Ed.), *Proceedings from Nordic Network in Logopedics*. Bergen: University of Bergen.
2. Helland, T., Tjus, T., Hoveden, M., Ofte, S. H., & Heimann, M. (in press). Effects of ta bottom-up and a top-down intervention principle in emergent literacy in children at risk of developmental dyslexia. Alongitudinal study. *Journal of Learning Disabilities*.
3. Specht, K., Hugdahl, K., Ofte, S. H., Nygård, M., Bjørnerud, A., Plante, E., et al. (2009). Brain activation reveals at-risk for dyslexia in 6-year old children. *Scandinavian Journal of Psychology, 50*, 79-91. doi: DOI: 10.1111/j.1467-9450.2008.00688.x
4. Westerhausen, R., Helland, T., Ofte, S. H., & Hugdahl, K. (in press). A lonitudinal study of inter-hemispheric interaction in boys and girls at age 5 to 8. *Developmental Neuropsychology*.
5. Westerhausen, R., Luders, E., Specht, K., Ofte, S. H., Toga, A. W., Thompson, P. M., et al. (in press). Structural and functional re-organisation of the corpus callosum between the age of 6 and 8 years. *Cerebral Cortex*.

National

1. Helland, T., & Ofte, S. H. (2004). Ut med språket! En longitudinell studie av barn i risikosonen for å utvikle vansker innen områdene lesing, skriving og matematikk. *Norsk tidsskrift for logopedi, 3*(50), 20-21.
2. Helland, T., Ofte, S. H., & Hugdahl, K. (2007, 19.04.2008). Ut med språket!, *Bergens Tidende*.
3. Hoveden, M. (2007). *Den skal tidleg krøkjast som god krok skal bli. Om førebyggjande tiltak før formell leseopplæring for barn som står i fare for å utvikle dyslektsi*. Master thesis, University of bergen, Bergen.
4. Løvøy, E. (2008). *"Lita tue kan velte storr lass"*. Master, University of Bergen, Bergen.
5. Nysæter, R. (2008). *Tidlige kognitive kjennetegn på dysleksi*. Master thesis, University of Bergen, Bergen.
6. Naas, M. (2009). *Bokstavkunnskap og ordlesing. En kvantitativ undersøkelse av barn i alderen 5-7 år som er o risikosonen for å utvikle dysleksi*. Master, Universitetet i bergen, Bergen.
7. Ofte, S. H., & Helland, T. (2004). Ut med språket! *Norsk Tidsskrift for Logopedi, 3*, 20-21.
8. Ofte, S. H., & Helland, T. (2005). "Ut med språket!" En longitudinell studie av barn fra 5 til 8 år som står i fare for å utvikle lese-, skrive-, og matematikkvansker. *Nevropsykologi, 8*(1), 18-20.
9. Ofte, S. H., Helland, T., & Hugdahl, K. (2008). En kvalitativ rapport om gjennomføringen av "Ut med språket" (UMS), en longitudinell undersøkelse av barn fra 5 til 8 år som står i fare for å utvikle lese- og skrivevansker i skolen. *Norsk tidsskrift for logopedi, 2*, 27-32.
10. Olsen, S. (2009). *Fonologisk bevisthet hos barn i risikosonen for å utvikle dysleksi*. Master, Universitetet i Bergen, Bergen.
11. Sørheim, E. J. (2009). *Arbeidsminne og skriftspråkutvikling. En studie av forholdet mellom auditivt arbeidsminne hos barn på sju år og tidlige skriftspråkvansker*. Master, Universitetet i Bergen, Bergen.
12. Vikebø, H. (2009). *Dysleksi og visuo-spatiale ferdigheter*. Master, Universitetet i Bergen, Bergen. .

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