The Future of SJOVS

The Scandinavian Journal of Optometry and Visual Science is publishing its 17th volume this year and we are celebrating this with expanding the editorial board with 10 new members with scientific expertise within visual science, optometry, ophthalmology, orthoptics, vision rehabilitation and psychology:

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Richard Wilkie, PhD — Professor of Cognitive Psychology at University of Leeds, UK

We are excited about working with these accomplished and enthusiastic eye and vision scientists, and what the future holds for *SJOVS*. Meanwhile, Helle K. Falkenberg has served on the editorial board for a few years and will step down. We thank her for her services and her valuable contributions to the journal. For details about the full editorial team please visit: https://open.lnu.se/index.php/sjovs/about/editorialTeam.

In this issue of *SJOVS*, you can read about validation of the Norwegian translation of reading tests suitable for adults and persons with visual impairment (Nachtnebel & Falkenberg, 2024). The first evaluation of a digital referral system for supporting paediatric optometrists in their decision making to relieve the specialist health services by providing children with an eye examination and vision correction earlier and more easily (Horgen et al., 2024). Both these tools are expected to become very valuable not only to further clinical practice, but also for research.

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Horgen, G., Hummelen, M., Strasser, E., Svarverud, E., & Sten, L.-G. B. (2024). Evaluation of pediatric vision screening and digital referral routines in an interprofessional setting in Norway. *Scandinavian Journal of Optometry and Visual Science*, *17*(1), 1–6. https://doi.org/10.15626/sjovs.v16i2.4083

Nachtnebel, D. A., & Falkenberg, H. K. (2024). Validation of the Norwegian International Reading Speed Texts (IReST) in adult readers with normal vision. *Scandinavian Journal of Optometry and Visual Science*, *17*(1), 1–5. https://doi.org/10.15626/sjovs.v16i2.4102

We wish all authors and readers a peaceful summer.

Editor-in-Chief Rigmor C. Baraas
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Letter to the Editors

Sara Flodin

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Dear Editors,

I read with interest the editorial "What is happening in Sweden?" by Macedo et al. (2023).

I would like to make a clarification that the revision of the laws that govern optometrists' responsibilities in Sweden did not include eye exams and prescribing refractive corrections to children under the age of 8 years.

References

Macedo, A. F. T., Johansson, O., & Baraas, R. (2023). What is happening in Sweden? *Scandinavian Journal of Optometry and Visual Science*, *16*(1), 1–2. https://doi.org/10.15626/sjovs.v16i1.3989

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Letter to the Editors: Reply to Flodin.

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Received January 26, 2024, accepted February 29, 2024.

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Dear Editors,

Thank you for the opportunity to reply to the letter from Sara Flodin. The letter clarifies some of the information contained in my summer editorial of July 2023 and is useful to the readers of the journal.

In the editorial I wrote tentative information: "From January 2024 the main planned changes to the law" — however, the update in the law became public on July the 10^{th}, 2023, by then the search for information for the editorial was closed.

I look forward to further collaborations with educational institutions and professionals with the aim to provide the best possible training for eye care practitioners and protect the sight of people in all parts of the world!

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Validation of the Norwegian International Reading Speed Texts (IReST) in adult readers with normal vision

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Abstract
There is a lack of standardised reading tests in Norwegian suitable for adults and persons with visual impairment (VI). The International Reading Speed Texts (IReST) measure reading performance of longer paragraphs. The aim of this project was to translate and validate the IReST in Norwegian.

Each of the German, English and Swedish IReST were translated into Norwegian. The translations were matched for length, linguistic difficulty, and structure, and piloted in five adults. Reading speed was assessed in 25 readers (41 years, *SD* = 10) with normal vision and the readings were recorded. Reading speeds were analysed for variability between texts and participants.

There were no statistically significant differences between the ten texts (135 words, 765 characters [$SD = 18$], word variation index 91.8% [$SD = 0.9\%$]). Reading speed in adult readers was 204 ($SD = 31$) words/min. There was no difference across texts for any of the participants ($p > 0.05$). Reading speed variance was 77.4% between subjects and 22.6% between texts.

The Norwegian IReST is standardised and comparable to the international IReST tests. Reading speed falls within normative values in adult readers. The Norwegian IReST will be a valuable tool in assessing reading in clinical health care, rehabilitation and educational practice of adult and visually impaired readers and in reading research.

Keywords: paragraph reading, reading speed, sentences, text reading, reading test, reading performance

Introduction
Reading is one of the most fundamental skills of daily life today, almost regardless of geographical and social standing. Good reading skills are required to be able to actively participate in society. In many ways, you have a greater disability as a poor reader today than in the past, and this is especially critical among people who are visually impaired (Kaltenegger et al., 2019; Lamoureux et al., 2007). Reading is a complex process, involving optical, neurological, cognitive and oculomotor factors. Reading requires both a clear image, precise eye movements, good field of view and a high degree of comprehension (Brussee et al., 2014; Mitzner & Rogers, 2006). In addition, reading can be challenging due to a range of visual perceptual issues (Chung et al., 2019; Mitzner & Rogers, 2006). The art of reading is about decoding signs perceived through sight and then systematising these into larger meaningful units, from letters, via words to sentences. In clinical practice, visual acuity is the most common measure used to assess central visual function (Kaiser, 2009). However, visual acuity measures the spatial resolution of the fixating retinal area, but is not adequate when measuring reading, or other aspects of functional vision in daily life. Reading problems are very often the main reason why people seek help when they have vision problems and improvement of reading is a main goal in visual rehabilitation (Elliott et al., 1997; Hazel et al., 2000; Radner, 2017; Rubin, 2013).

To measure reading skills effectively, a selection of objective and standardised tests for reading function are needed (Legge, 2006; Rubin, 2013). Some tests measure reading speed, while others measure reading comprehension, or are intended for groups of people with special problems, such as decoding difficulties, visual impairments, or cognitive difficulties (Legge et al., 1992; Legge, 2006; Radner, 2017; Rolle et al., 2019). There is a lack of standardised reading tests in Norwegian for visually impaired readers that measure functional reading over longer paragraphs. Standardised tests are important both in regard to measuring visual function, and in regard to measures of reading function, in order to help people with impaired vision in daily life (Lovie–Kitchin, 2011; Rolle et al., 2019).

Reading speed is used as a reliable measure in research on reading, because it is easy to measure objectively, sensitive to changes in both vision and text type and makes sense for readers (Carver, 1992; Legge, 2016). The International Reading Speed Texts (IReST) were created in German to measure reading ability and reading fluency. They were later translated into English and the test is currently available in 19 languages (Gleni et al., 2019; Precision Vision, 2021; Trauzettel-Klosinski & Dietz, 2012). The IReST texts are mainly taken from factual literature for children aged 9–11 years and text material for 6th grade. The texts are intended to be neutral and easily read and understood (Hahn et al., 2006). One advantage is that IReST consist of ten texts, where each text is standardised in terms of content, length, degree of difficulty and linguistic structure. This makes IReST suitable for comparing reading speed between languages. Furthermore, IReST have the advantage of containing longer paragraphs, which are more similar to reading ordinary texts and they have been shown to give less variability in reading speed compared to more traditional tests using shorter texts (Altpeter et al., 2015; Rubin, 2013). IReST has been used to measure reading in normal ageing persons and in people with impaired vision and reading disabilities (Morrice et al., 2021; Trauzettel-Klosinski & Dietz, 2012). There is a lack of standardised reading tests in Norwegian suitable for adult readers and persons with visual impairment, and the aim of this project was therefore to translate and validate the IReST in Norwegian.

Methods
Linguistic development of the Norwegian IReST
The ten IReST texts were translated from the original German version into Norwegian by a linguist (DN), a fluent speaker of both Norwegian and German. The difficulty and complexity of the texts were set at the reading level of 10–12-year-old children (Hahn et al., 2006). To help ensure that all the Norwegian texts had the same readability and were easy to read, the texts were analysed using LIX, a calculation tool of Scandinavian origin designed to evaluate the linguistic complexity of a text (Anderson, 1983). The LIX formula uses the number of words, the number of long words (six letters and more), and the number of sentences to calculate a readability score (LIX score) and three underlying scores indicating word variability and vocabulary richness (TTR, OVIX and OVR). The goal was to ensure that all texts were within the easy-to-read-category (a LIX score between 30 and 40) (Anderson, 1983; Björnsson, 1983; Nordtømme, 2023). According to this, the Norwegian translated texts should be

easy to read, with a LIX score of 35 and a high word variability ratio (see Table 1 for details). Data collection was undertaken as part of a master's thesis (DN) at University of South-Eastern Norway (Nachtnebel, 2023) and some results have been presented at the ARVO conference (Nachtnebel & Falkenberg, 2023).

Table 1: *The LIX readability indexes of the ten Norwegian texts*

Text	LIX*	Type Token Ratio TTR %	Word Variability Index OVIX %	Word Variability Ratio OVR %
1	35	67.4	63.4	92
2	35	69.9	68.9	92.6
3	35	65.9	60.2	91.5
4	35	71.1	73	93.1
5	35	66.7	61.8	91.7
6	35	60.7	50.7	90
7	35	70.4	70.9	92.8
8	35	65.2	58.7	91.3
9	35	66.7	61.8	91.7
10	35	65.9	60.2	91.5
Mean (SD)	35	67.0 (3)	62.9 (7)	91.8 (1)
95% CI		[65, 69]	[58, 68]	[91, 92]

Note: *LIX score range from 0–100, where 35 is within the easy read category.

As for earlier IReST texts, Gibson's syntactic prediction locality theory (SPLT) was used in the analysis of the translations (Gibson, 1998; 2000). According to Gibson, information in the immediate context of a word is used to predict the syntactic structure of a sentence. Therefore, it was important that the Norwegian texts had equal cognitive processing load, while simultaneously incorporating syntactic diversity to prevent the reader from benefiting by recognising a pattern.

To adjust for fluency, the Norwegian texts were additionally translated from the English and Swedish texts independently by both authors, fluent in both languages. Details were discussed until consensus was reached on the final versions. The aim was to make the Norwegian version similar in difficulty, linguistic complexity, and word and sentence lengths to these versions. See Figure 1 for a comparison of texts in the different languages. This also ensured that the Norwegian texts were comparable across languages.

Table 2 shows the parameters for the ten Norwegian texts. All consist of 135 words, 20% long words (over six letters), and nine sentences. The number of characters (including spaces and line breaks) for each text is 741–800, with a mean of 765 ($SD = 18$). The mean number of characters per word is 5.7 ($SD = 0.1$), and the mean number of syllables per text is 227 ($SD = 8$). Texts with mainly short words have fewer syllables and are easier to read, process, understand, and recognise, which is beneficial to all readers. All texts have 16 lines with a maximum line width of 8.5 cm. Like the other existing IReST languages, the Norwegian translation uses a Times New Roman font size of 10 (equivalent to visual acuity 0.4 logMAR at 40 cm viewing distance or 1M unit) and 12-point line spacing (Hahn et al., 2006), corresponding to most newspaper print sizes. The finished texts were printed in high contrast on white 120 g matt paper.

To assess the readability of the first Norwegian texts, the ten texts were piloted on five subjects with normal vision and reading skills. Words or sentences where the subjects hesitated or made mistakes were substituted. This did not influence the number of words, characters, and letters in the final texts.

Beveren er en fremragende svømmer. I vann kan den
oppnå en hastighet på opptil ti kilometer i timen. For å
beskytte seg mot kulde har beveren et tykt fettlag og en
pels med tusenvis av hår. Ved help av sine store lunger
kan den uten problemer være under vann i inntil tjue
minutter. Beveren er ikke bare dyktig til å felle trær,
men den er også flink til å bygge demninger.

Der Biber ist ein vorzüglicher Schwimmer. Er kann im
Wasser eine Geschwindigkeit von bis zu zehn Kilometern
in der Stunde erreichen. Sein Schutz gegen die Kälte
besteht aus einem Pelz mit Tausenden von Haaren und
einer dicken Fettschicht. Mit seiner großen Lunge kann
er leicht zwanzig Minuten unter Wasser bleiben. Der
Biber kann nicht nur geschickt Bäume fällen, sondern er
ist auch ein erfahrener Handwerker

The beaver is an excellent swimmer. It can achieve a
speed of up to seven miles per hour in water. Its
protection against the cold consists of a skin with
thousands of single hairs and a thick layer of fat. With
its big lungs it can easily stay under water for more than
twenty minutes. The beaver is not only skilful in felling
trees, but also an experienced craftsman in building
dams. When the beaver fells a tree, it gnaws

Bävern är en mycket skicklig simmare. I vattnet når den
hastigheter av mer än elva kilometer i timmen. För att
skydda sig mot kylan har báverns hud tusentals små
hårstrån och ett tjockt lager med fett. Med hjälp av sina
stora lungor kan den stanna under vattenytan mer än
tjugo minuter utan problem. Bävern är inte bara duktig
på att fälla träd, den är också en skicklig dammbyggare.
När bävern fäller

Figure 1: *Extracts from the Norwegian, German, English and Swedish versions of IReST text 2 showing only the first eight lines.*

Table 2: *Parameters and values for the Norwegian IReST texts*

Text	No. words	No. syllables	No. characters	Syllables per word	Characters per word
1	135	220	753	1.6	5.6
2	135	217	741	1.6	5.5
3	135	216	761	1.6	5.6
4	135	236	800	1.7	5.9
5	135	223	768	1.7	5.7
6	135	227	765	1.7	5.7
7	135	227	748	1.7	5.5
8	135	240	786	1.8	5.8
9	135	233	756	1.7	5.6
10	135	229	773	1.7	5.7
Mean (SD)	135 (0)	227 (8)	765 (18)	1.7 (0.1)	5.7 (0.1)
95% CI		[221, 233]	[752, 778]	[1.6, 1.7]	[5.6, 5.8]

Participants

Twenty-five adults (18 females) aged 18 to 60 years of age ($M = 41$, $SD = 10$) with normal vision and reading abilities were recruited from the University of South-Eastern Norway and Statped. Inclusion criteria were: adults over 18 years, fluent in Norwegian, no diagnosed reading/attention disabilities, and normal or corrected to normal vision (near visual acuity [VA] $\leq$ logMAR 0.0 [decimal VA $\geq$ 1.0], contrast sensitivity $\leq$ 1.68 logCS). The participants' mean near VA, mean distance VA, and Mars contrast sensitivity were -0.07 logMAR ($SD = 0.07$), -0.15 logMAR ($SD = 0.22$) and 1.81 logCS ($SD = 0.05$), respectively. The sample size of 25 was matched to the original IReST-study (Hahn et al., 2006). This also satisfies an a priori power analysis calculated with G*Power 3.1 (Kang, 2021). Testing the difference from a constant and a two-tailed test, a sample size of 23 was required to achieve power of 0.95 with a large effect size ($d = 0.8$), and an α of 0.05 (Faul et al., 2007).

Written and oral information about the study was provided, and each participant gave written informed consent before taking part. The study was approved by the Norwegian Centre for

Research Data (ref: 56168) and was conducted in line with the Declaration of Helsinki (World Medical Association, 2013).

Procedure

Texts were presented in random order on a table with a viewing distance of 40 cm. The mean illumination was 767 lux ($SD = 142$) avoiding glare. Participants were told to read each text once aloud and as quickly as possible, and not to correct mistakes along the way. The readings were recorded, and all audio recordings were reviewed in an editing program to measure the reading time(s). All errors were counted and noted. To uncover any error patterns across readers, incorrect words were marked with brackets and colour.

Data and statistical analysis

For this dataset, reading speed means, medians and standard deviations for each text and each participant were calculated. In accordance with work by the IReST group, characters per minute were calculated by including spaces and line breaks and the relative standard deviation was calculated as SD/mean reading speed in words/min × 100 (Hahn et al., 2006; Messias et al., 2008). One-way analysis of variance (ANOVA) followed by Levene's post-hoc tests were used to compare reading speed. The null hypothesis was that there was no difference between the texts. The IReST group set a limit of 4 *SD* for outliers (Trauzettel-Klosinski & Dietz, 2012). In the data set from the Norwegian pilot study there were no outliers, and all data were included in the analysis. Alpha was set to 0.05, and analyses were performed in IBM SPSS Statistics (Version 24, US).

Results

The results showed that normally sighted adults read the ten texts with a mean reading time of 40.5 ± 5.8 sec. This corresponds to a mean reading speed of 204 words/min ($SD = 6$, 95% CI [200, 209]). Table 3 shows that Text 2 was the fastest read text (215.2 words/min) and Text 4 was the slowest (196.4 words/min). However, the differences in reading speed between the texts (ANOVA $F[9,240] = 0.81$, $p = 0.6$; Levene's test $p = 0.82$) and within individual participants were not significant (all $p > 0.05$) (See Table 3 and Figure 2).

Table 3: *Mean (SD) reading speed and performance categories for each text*

Text	Performance category	Words per min	Min/max	Syllables per min	Characters per min
2	A	215	155/303	337	1151
1	A B	210	160/273	335	1148
9	A B C	209	151/312	350	1137
5	A B C D	206	165/308	334	1152
7	A B C D	205	156/266	340	1121
6	B C D	204	149/308	334	1126
3	B C D	200	144/274	314	1105
10	B C D	200	143/260	331	1118
8	C D	199	153/246	349	1142
4	D	196	148/268	336	1139
Mean (SD)		204 (31)		336 (10)	1133 (16)
95% CI		[200, 209]		[329, 343]	[1123, 1145]

The total variation between all readings ($n = 250$) was distributed so that 77.4% lies between the individuals, while 22.6% of the mean variation was between the texts. Relative standard deviation varied between 2.6 and 8.4% among individuals ($M = 4.5\%$).

Performance categories

The texts were divided into IReST performance categories based on mean reading speed per text (Hahn et al., 2006), as shown in Table 3. The ten Norwegian texts showed a total difference in reading speed of 18.8 words/min. For the total order of reading speed, see Table 3. The Norwegian texts were grouped into categories A to D, where each category represents a ten words/min range of reading speeds (Hahn et al., 2006). Performance category A starts from the fastest read text (Text 2 at 215 words/min). With a ten words/min range, category A has a range of reading speed from 215 to 205 words/min, and includes texts 2, 1, 9, 5 and 7 (Table 3). Category B was then calculated from the fastest read text outside category A (Text 6 at 204 words/min), and spans ten words/min upwards to 214 words/min (204 + 10 words/min). Since there were no text read at 214 words/min, category B starts at the first read text within the calculated range which is Text 1 at 210 words/min. With ten words/min for each category, category B now covers reading speeds from 210 to 200 words/min (see Table 3). All texts belonging to the same category can be used in repeated measurements because they do not differ by more than ten words/min. It also means that most texts belong to more than one category and can be exchanged with all the other texts (for example, Text 5 and Text 7 which are included in all four categories [A–D]). This means that the Norwegian IReST is well suited for repeated measurements as there are at least five texts to choose from within the same category.

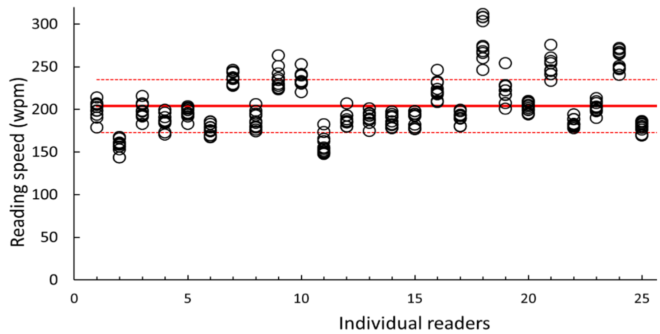

Figure 2: *IReST reading speeds of all ten texts for individual adults. Solid and dashed lines show the mean and standard deviation for reading speed across the texts and all individuals.*

Discussion

The aim of this project was to validate the IReST reading test in Norwegian for adult readers. The text analysis showed that all ten texts had overlapping language parameters (number of words, sentences, sentence lengths, word lengths and readability index), with low variation between the texts.

The values are in line with IReST tests in other languages (Gleni et al., 2019; Hahn et al., 2006; Messias et al., 2008; Morrice et al., 2020; Trauzettel-Klosinski & Dietz, 2012). The Norwegian texts all have the same number of lines. This is in line with the Swedish translation, but in contrast to e.g., the English and German texts. The advantage of keeping the line number constant is that this influences the reading performance variables, as line breaks can be demanding for visually impaired or poor readers. Future research should consider the use of eye tracking to further elucidate the effect of line breaks when reading in both normal and visually impaired readers (Wang et al., 2023).

The reading speed was not significantly different in the ten standardised texts, with reading speeds similar to the German, English and Swedish texts they were translated from. The total variation between the ten texts was within the spread in the other languages (Gleni et al., 2019; Trauzettel-Klosinski & Dietz, 2012). The results show that the Norwegian translation meets the requirements for IReST, corresponds to the standardisation of already existing tests (Gleni et al., 2019; Hahn et al., 2006; Messias et al., 2008; Trauzettel-Klosinski & Dietz, 2012), and can be used as a test to assess reading performance. In comparison with the mean reading speed in the other languages, the Norwegian results are in the upper level, placed fourth, after English, Spanish and Greek, and before Dutch, Swedish and French. Different languages have different word lengths, and it is worth noting that short words lead to higher reading speeds when comparing words per minute across languages.

Another strength of this study is that a standardised and validated Norwegian paragraph reading test has now been established, which will be clinically important and where the results can be compared to international findings (Gleni et al., 2019; Hahn et al., 2006; Messias et al., 2008; Morrice et al., 2020). The study also shows that, although there are individual variations for each person, the variation between texts is low even with a small sample of individuals. This means that reading speed can be assessed and compared across texts in individual readers, but that one should be careful to compare across readers. The Norwegian IReST will be valuable in assessing reading in both research and clinical practice.

A limitation of this study was the design of this validation study, which makes it impossible to establish normal population values. Although our results compare to international reading performance, future studies, in larger samples, are needed to establish Norwegian normal values across age groups, reading disabilities, or in low vision.

Future research and development should also consider a digital test alternative to utilise new technology for assessing and monitoring functional reading in visual rehabilitation in adults, in the clinic and at home.

Overall, this study shows that the Norwegian texts are validated and comparable with other IReST texts.

Conclusion

The results show that there are no significant differences between the ten Norwegian texts, and that they can be used for repeated measurements in adults with normal vision. The results also show that the Norwegian IReST values for reading speed are among the fastest, similar to English and Swedish. The Norwegian IReST reading test will be a valuable addition in clinical practice and for research as an important tool in the evaluation of reading function over time. With today's technology, it would also have been useful to be able to expand the testing apparatus with digital tools, which would increase the test availability and could lead to an even greater degree of standardisation.

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Validering av den norske International Reading Speed Texts (IReST) lesetesten

Sammendrag

Det er et behov for standardiserte lesetester på norsk, som også passer for voksne personer med synshemming. Den internasjonale lesetesten IReST (International Reading Speed Texts) måler lesefunksjon over lengre tekstavsnitt. Målet med dette prosjektet var å oversette og validere IReST til norsk.

De opprinnelige tyske, engelske og svenske IReST-tekstene ble oversatt til norsk. Oversettelsene ble analysert med hensyn til tekstlengde, språklig vanskelighetsgrad og struktur, og pilotert på fem voksne. Lesehastigheten ble deretter målt på 25 deltakere (41 år, $SD = 10$) med normalt syn. Det ble gjort opptak og lesehastigheten ble analysert for variasjon mellom tekster og deltakere.

Det var ingen statistisk signifikante forskjeller mellom de ti tekstene (135 ord, 765 tegn ($SD = 18$), ordvariasjonsindeks 91,8% ($SD = 0{,}9\%$)). Gjennomsnittlig lesehastighet hos voksne lesere var 204 ($SD = 31$) ord/min. Det var ingen signifikant forskjell mellom tekstene for noen av deltakerne ($p > 0{,}05$). Fordelingen av variansen i lesehastighet var 77,4% mellom deltakere og 22,6% mellom tekstene.

Den norske IReST-testen er standardisert og sammenlignbar med de internasjonale IReST-testene. Lesehastigheten faller innenfor normative verdier hos voksne lesere. En norsk utgave av IReST vil være et verdifullt verktøy for å vurdere lesing i klinisk helsevesen, rehabilitering og utdanningspraksis for voksne og synshemmede lesere, samt i leseforskning.

Nøkkelord: Avsnittslesing, lesehastighet, setninger, lesetest, leseprøve, leseferdighet

Validazione della versione Norvegese dell'International Reading Speed Texts (IReST) in lettori adulti con visione normale

Riassunto

Mancano test di lettura standardizzati in Norvegese, adatti per adulti e persone con disabilità visive (DV). L'International Reading Speed Texts (IReST) misura le abilità di lettura in paragrafi lunghi. L'obiettivo di questo progetto è tradurre e validare IReST in Norvegese.

Le versioni in Tedesco, Inglese e Svedese di IReST sono state tradotte in Norvegese. Le traduzioni sono state adattate per lunghezza, difficoltà linguistica e struttura, e sottoposte a prova pilota su cinque adulti. La velocità di lettura è stata misurata in 25 lettori (41 anni, $SD = 10$) con visione normale e le letture sono state registrate. Le velocità di lettura sono state analizzate per variabilità tra testi e partecipanti.

Non sono state trovate differenze statisticamente significative tra i dieci testi (135 parole, 765 caratteri [$SD = 18$], indice di variazione delle parole 91.8% [$SD = 0.9\%$]). La velocità di lettura in lettori adulti è stata di 204 ($SD = 31$) parole/min. Non è stata riscontrata differenza tra testi per nessuno dei partecipanti ($p > 0.05$). La varianza della velocità di lettura era 77.4% tra i soggetti e 22.6% tra i testi.

La versione in Norvegese dell'IReST è standardizzata e comparabile alle versioni internazionali. La velocità di lettura rientra nei valori normativi dei lettori adulti. La versione Norvegese dell'IReST rappresenta uno strumento prezioso nella valutazione della lettura nella pratica clinica, nella riabilitazione e nella pratica educativa di lettori adulti e con deficit visivi, nonché nella ricerca sulla lettura.

Parole chiave: Lettura di paragrafi, velocità di lettura, frasi, test di lettura, abilità di lettura

Evaluation of paediatric vision screening and digital referral routines in an interprofessional setting in Norway

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Abstract

Vision is crucial for childhood development, and ensuring good vision in children is one of the United Nation's sustainability goals. Most countries have a childhood vision screening programme, and in Norway screening in children aged 4–5 years is performed in community health centres (CHC). Specialist health services such as ophthalmology and/or orthoptics are the referral bodies. However, access to these may be limited and they may be a long distance away from the child's home, while optometrists are often more available and accessible. This study aims to investigate if vision screening reliably detects vision problems and to explore if using paediatric optometry as a referral body can relieve the specialist health services. The study also aims to report frequency of refractive errors and management of vision problems in this age group.

Of 274 children who attended vision screening by school nurses at the CHC in Kongsberg, Norway, parents of 213 (77.7%) consented to a separate eye and vision examination by a paediatric optometrist. Agreements in screening results between school nurses and the paediatric optometrists were evaluated. Separately, an ophthalmologist and an orthoptist assessed records from the eye examinations through a digital communication tool (Eyecheck System AS). Agreements in diagnoses and management decisions between optometrists and the specialist health services were evaluated.

Amblyopia or ocular pathology was found in 1.9% of the children, which were all identified by the vision screening. The vision screening had a sensitivity and specificity of 62.3% and 58.6%, respectively, for detecting other vision problems in need of treatment or follow-up. Hypermetropia was present in 82.7% of the children (58.0% low, 18.5% moderate, 6.5% high hypermetropia), 16.4% had emmetropia and 1.0% had myopia. Glasses were prescribed to 8.5% of the children and 16.4% were scheduled for follow-ups. There was a high level of agreement in management between optometrists and specialists (ophthalmologist 80.3%, orthoptist 81.7%).

The vision screening reliably detected amblyopia and ocular pathology, and most refractive errors were detected. The high degree of agreement between the three eye care professions suggests that paediatric optometrists can be used as the referral body for this age group. Availability of a digital communication tool provides support for the paediatric optometrists in their decision making and can help relieve the specialist health services by providing children with an eye examination and vision correction earlier and more easily.

Keywords: vision screening, children, amblyopia, hypermetropia, refractive errors

Introduction

Vision plays an important role in the ability to learn, from the very beginning of life, throughout childhood and in adolescence. Optimal vision and eye health is critical for academic development, attaining a healthy life, social and economic independence, and optimised functional ability (Basch, 2011; Marshall et al., 2010; Narayanasamy et al., 2015). Indeed, vision is so important that the United Nations in 2021 included vision as one of the sustainability goals because good eyesight and eye health contribute directly to prospects for education and good health in children and young people (United Nations, 2022; Zhang et al., 2022). Children use their vision actively from birth, and neural feedback from the retina is crucial for normal visual development. Important visual functions develop and mature early in life, and visual disturbance can cause irreversible damage. Amblyopia is the main cause of vision loss in children (Kvarnström et al., 2001; Robaei et al., 2005) and it has been shown that children with amblyopia have reduced reading speed and motor skills compared to their peers (Kelly et al., 2015; 2020; Webber et al., 2008). Other negative consequences include lower social acceptance and self-esteem (Dudovitz et al., 2016; Tailor et al., 2022). For these reasons, most countries have a childhood vision screening program.

Vision screening in Norway is performed as a part of the mandatory routine examination at a community health centre (CHC) (Helsedirektoratet, 2021). Attendance rate for the health screening program for 4–5-year-olds is high (90.4–97.3%) (Statistisk Sentralbryå, 2022). The main purpose of vision screening is to detect amblyopia and other sight-affecting conditions, and the vision assessment includes monocular visual acuity at distance. Children who do not pass the screening criteria are referred to the specialist health service, which is most often an ophthalmologist, sometimes including an orthoptist or an optometrist. In Norway, prescription for refractive errors is within the scope of practice for ophthalmologists and optometrists, but not for orthoptists.

Uncorrected refractive errors are the main cause of decreased vision in the general population (Dandona & Dandona, 2001; Naidoo & Jaggernath, 2012). The prevalence and distribution of refractive errors depend on the location, the age, and the ethnicity of the population. Classification of refractive errors (power limits for determining hypermetropia, myopia and astigmatism), whether cycloplegia was used, and method of measurement are important factors that play a role in determining the prevalence. In Caucasian populations, hypermetropia is shown to be the most prevalent refractive error in the youngest age groups (Hashemi et al., 2018; Jiang et al., 2019; O'Donoghue et al., 2012; Sandfeld et al., 2018; Slaveykov & Trifonova, 2020), while the prevalence of myopia is much lower (Grönlund et al., 2006; Sandfeld et al., 2018) than in East-Asian and Southeast-Asian countries (Dirani et al., 2010; Goh et al., 2005; He et al., 2009). In Scandinavia, studies have reported higher occurrence of hypermetropia compared to myopia in both primary and secondary school children, and in adolescents (Demir et al., 2021; Falkenberg et al., 2019; Hagen et al., 2018).

While amblyopia is sight threatening and therefore important to discover, there is increasing knowledge and awareness of how mild to moderate non-amblyogenic uncorrected refractive errors may contribute to problems later in life. Hypermetropia is associated with reduced emergent literacy (Kulp et al., 2016) and reduced academic performance (Mavi et al., 2022), and may contribute to school dropout (Markussen et al., 2008). Detecting and correcting refractive errors at an early stage is considered beneficial not only for visual development in the individual, but also to increase school attendance and improving academic performance (Dudovitz et al., 2020).

Even though Norway has a well-established welfare system, there is no mandatory vision screening program after the age of 4 years, and it is therefore fundamental to identify children with vision problems that may affect academic development at the vision screening at age 4–5 years.

This study aims to investigate whether vision screening and follow-up in a population of non-selected 4–5-year-olds in Norway can be used to detect and manage children with amblyopia and refractive errors. Further, the study explores agreement of clinical judgements between optometrists specialising in eye examinations in pre-school children, orthoptists and ophthalmologists by using a digital communication tool. A secondary aim is to investigate the frequency of refractive errors, and to determine the need for vision correction in this population.

Materials and Methods

Participants

The study was performed in a middle-sized Norwegian town, Kongsberg, which has about 28 000 inhabitants (1643 per km^2) and is representative of the Norwegian population regarding public health and socio-demographic status. In the health screening program between November 1st 2018 and October 31st 2019, 285 children aged 4–5 years were invited to attend the mandatory routine examination at the local community health centre (CHC), and 274 children (96.1%) attended. A total of 77.7% ($n = 213$) of the invited population consented to attend the National Centre for Optics, Vision and Eye Care (NCOVE) at the University of South-Eastern Norway for a full eye and vision examination.

All children attending the screening were invited to participate in the study, and those who consented were given an eye and vision examination by a paediatric optometrist at NCOVE.

Procedures

The school nurses at the community health centre were given a one-day learning and training course in vision screening, provided by NCOVE. During vision screening, the school nurses measured monocular visual acuity (VA) at a distance of 3 m, using a logMAR Lea symbol visual acuity chart according to the national guidelines for vision screening (Helsedirektoratet, 2021).

The eye and vision examinations at NCOVE were performed by paediatric optometrists. Monocular VA was measured at 6 m and binocular VA at 33 cm with logMAR Lea symbol visual acuity charts (Laméris Ootech, Ede, Netherlands). Stereo acuity (SA) was tested using the TNO stereo acuity test at 40 cm, and for those who could not complete the TNO test, the Lang II (Lang-Stereotest AG, Switzerland) was used. Ocular alignment was assessed by the Hirschberg test and the prism cover test (at 6 m and 40 cm). Ocular motility was assessed using a penlight, and near point of convergence using a fixation stick. Refraction was performed 30–40 minutes after the instillation of one drop of Cyclopentolate 1%, and two drops were used if the child had dark brown irises. Cycloplegic refraction was measured with a Huvitz HRK-8000A autorefractor (Huvitz Co. Ltd., Gyeonggi-do, Korea), substituted with cycloplegic retinoscopy when autorefraction could not be completed. Children with refractive errors outside predefined limits as defined by Leat (2011) (see below), also underwent cycloplegic retinoscopy to decide the final correction. Fundus photos were taken of both eyes. If the photos were of poor quality or there was any suspicion of abnormality, indirect ophthalmoscopy was performed. The optometrist made a diagnosis and prescribed the appropriate treatment (glasses or follow-up) as required.

Eye examination data as described above, and videos and photos from the eye and vision examination performed by an optometrist, were uploaded to a digital communication platform (Eyecheck System AS). The ophthalmologist and orthoptist did separate clinical judgments, made a diagnosis and suggested management.

Vision correction (glasses) was prescribed following predefined criteria according to Leat (2011). Children without amblyopia were given a prescription if they had myopia ≤ -1.00 dioptres (D), hypermetropia > +2.50 D, astigmatism ≥ 1.50 D (if oblique, ≥ 1.00 D) or anisometropia ≥ 1.00 D. Children with refractive errors close to the predefined criteria for correction were prescribed glasses or follow-up depending on the examiner's clinical judgment. Any suspected pathology or sight-affecting conditions were referred to the specialist health services at the local hospital.

The study followed the tenets of the Declaration of Helsinki and was approved by the Regional Committee for Medical and Health Research Ethics in Southeast Norway (REK 2018/1237). Both parents gave informed consent prior to inclusion in the study. Collection of VA data from the CHC was considered quality assurance and was approved by the Norwegian Agency for Shared Services in Education and Research (Sikt 402751).

Statistics

Statistical analysis was performed using Microsoft Excel and the IBM SPSS Statistics version 22. Pearson's correlations were used to look at covariations between tests. The α level was set to 0.05 for all statistical analyses.

Results

Vision Screening (CHC)

A total of 96.1% ($n = 274$) of the invited children presented for the mandatory health screening program during the test period. Seven children were already followed up by the local eye hospital, and four did not show for unknown reasons.

Mean age (± SD) was 49.7 ± 1.8 months (range 47–66 months, 50.0% males). Visual acuity (VA) was noted as the smallest line where three out of five symbols were seen on the logMAR Lea symbol visual acuity chart. VA was measured monocularly at 3 m for both eyes and binocularly at near, by a school nurse. VA was obtained successfully in most children. Mean VAs were 0.22 ± 0.10 logMAR (range 0.00–0.80) and 0.23 ± 0.12 (range -0.06–0.92) for the right and left eye, respectively. There was no significant difference between the right and left eyes (paired samples t-test, $t(226) = 0.13$, $p = 0.89$). Binocular VA at near was 0.23 ± 0.12 logMAR (range 0.00–1.00). A total of 57.7% ($n = 158$) of the children passed the VA criteria given in the national guidelines for vision screening.

There were 61 children attending the mandatory CHC vision screening whose parents did not consent to participation in the study. However, this study compared VA data collected by school nurses for these children as a quality control study. Mean VAs for the non-participating children were 0.19 ± 0.08 logMAR (range 0.00–0.60) and 0.19 ± 0.08 (range -0.06–0.50) for the right and left eye, respectively. Binocular VA at near was 0.19 ± 0.09 logMAR (range 0.02–0.44). 71.9% ($n = 46$) of these children passed the VA criteria given in the national guidelines for vision screening.

Eye examination (NCOVE)

A total of 77.7% ($n = 213$) of the invited population consented to attend NCOVE for a full eye and vision examination. Mean age was 51.2 ± 3.1 months (range 38–65 months, 48.8% males).

Gestational age was 39.7 ± 1.6 weeks (range 34–43 weeks). Most of the participants, 83.1% ($n = 177$), were of Northern European Caucasian ethnicity, i.e., both parents were born in Northern Europe (self-reported in the patient history). Other ethnicities (one or both parents) included African, 4.2% ($n = 9$), Middle Eastern, 4.2% ($n = 9$) and Asian, 5.2% ($n = 11$). Two children were premature (self-reported), born in week 34 and 35. Neither had received treatment for retinopathy of prematurity. One child had autism, and one had a genetic disorder. The remainder were healthy and did not report any previous eye or vision treatment.

Visual Acuity (VA)

The optometrists were able to obtain VA results for all children. Uncorrected VA was 0.10 ± 0.12 logMAR (range -0.10–0.90) in the right eye (RE), and 0.10 ± 0.13 (range -0.10–0.88) in the left eye (LE). There was no difference between the eyes (paired t-test, $p = 0.37$). Binocular near VA was 0.09 ± 0.12 logMAR (range -0.20–1.00).

The differences between VAs measured at the vision screening by the school nurses and VAs measured at the NCOVE eye examination were RE 0.13 ± 0.16 logMAR (range -0.80–0.78), LE 0.14 ± 0.14 logMAR (-0.58–0.68), and near 0.15 ± 0.16 logMAR (-0.80–0.88), and there was high correlation between the results from the vision screening and those measured at the NCOVE eye examination (r = -0.76, -0.54, and -0.59 for RE, LE and near, respectively). A Bland-Altmann plot revealed no proportional bias between VA measurements made by school nurses and at NCOVE. Further, there was no significant regression for the differences between the VA measurements ($F(1) = 0.867$, $p = 0.353$).

Stereoacuity (SA)

SA was in the range of 30–240″. Most children had SA of 60″ (72.8%, $n = 155$) or 120″ (14%, $n = 30$). Poorer SA was found in 12.7% ($n = 27$) children: five had SA of 240″ and one had SA of 480″ with the TNO test, 18 had 200″ and one had 550″ with the Lang test. Two children did not manage to complete any of the stereo tests.

Refractive errors

Cycloplegic autorefraction was completed in 198 (93.0%) children, while 9 (4.2%) underwent cycloplegic retinoscopy, and the remaining 6 (2.8%) underwent dry retinoscopy. The distribution of cycloplegic spherical equivalent refraction (SER) of right eyes is shown in Figure 1.

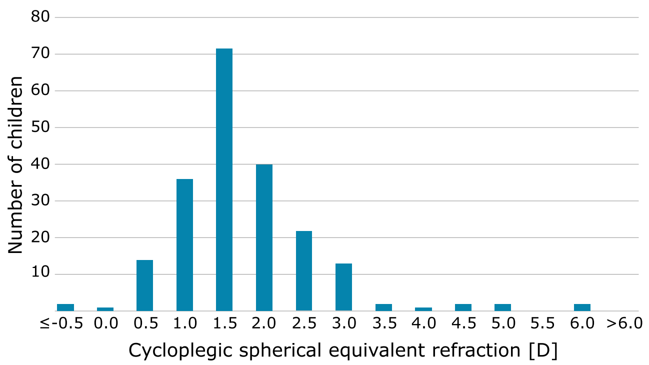

Figure 1: *Frequency of cycloplegic SER (D) of right eye in 207 children (SER values rounded up to the nearest 0.5 D).*

There was no significant difference between SER of right and left eyes (paired t-test, $p = 0.05$). Hypermetropia was the most prevalent refractive error (see Table 1). More than half the children (58.0%) had low hypermetropia, while 18.4% had moderate hypermetropia, and 6.3% had high hypermetropia. Emmetropia was found in 16.4% of the children, and only two (1.0%) had myopia. Glasses and follow-up were prescribed to 8.5% children, and 16.4% were prescribed follow-up only. For the remaining 75.1% no treatment was considered necessary.

Table 1: *The prevalence of refractive errors in the study population categorised by refractive groups*

Refractive error (definition)	Participants (n)	Participants (%)
Myopia (SER ≤ -0.50 D)	2	1.0
Emmetropia (-0.50 < SER < +1.00 D)	34	16.4
Low Hypermetropia (+1.00 ≤ SER < +2.00 D)	120	58.0
Moderate Hypermetropia (+2.00 ≤ SER < +3.00 D)	38	18.4
High Hypermetropia (SER ≥ +3.00 D)	13	6.3
Total (n)	207	100

Amblyopia and ocular pathology

Amblyopia was found in four (1.9%) children, all due to refractive error, and two (1.0%) were referred to the specialist health service: one had intermittent exotropia, and one had suspected optic disc oedema. None of the other children showed any sign of ocular malformations or external abnormalities.

Quality of the vision screening

All children with amblyopia or suspected pathology were identified by the vision screening program at the CHC. However, 40.5% ($n = 111$) of children did not pass the VA criteria at the vision screening even though they did not have amblyopia or suspected pathology.

To investigate if the vision screening could reliably detect all the children in need of management, this study calculated sensitivity and specificity for those who were prescribed glasses, follow-up, or referral following the NCOVE examination. True positives (TP, $n = 33$) were defined as children who failed the screening and were also found by the NCOVE examination to require treatment (glasses, follow-up or refer). False positives (FP, $n = 65$) were defined as children who failed the screening but could be discharged without any treatment. True negatives (TN, $n = 92$) were defined as children who passed the screening and could be discharged without any treatment, whereas false negatives (FN, $n = 20$) were defined as children who passed the screening but who were found by the NCOVE examination to require treatment.

Sensitivity and specificity including confidence intervals were calculated. Sensitivity of the vision screening program at the CHC was found to be 62.3%, 95% CI [55.6, 68.9], and specificity was 58.6%, CI [53.0, 64.2].

Treatment

The clinical assessments by the specialist health service (ophthalmologist and orthoptist) confirmed most of the clinical judgements made by the optometrists. There was agreement on whether children should be discharged or be given any kind of management in 80.3% of cases between the optometrists and the ophthalmologist, and in 81.7% of cases between the optometrists and the orthoptist.

The percentage of children considered not to require treatment was similar for the optometrists and the ophthalmologist (75.6% and 76.5%, respectively), while it was slightly lower for the orthoptist (71.0%). The percentage of children considered to require glasses was highest for the optometrists (8.5%), followed by the orthoptist (6.7%) and the ophthalmologist (3.8%). The percentage judged to require follow-up was highest for the ophthalmologist (19.2%) followed by the optometrists and orthoptist (14.6% and 17.7%, respectively). The decision to refer to specialist health service was most prevalent for the orthoptist (6.7%), while it was similar for the optometrists and ophthalmologist (1.4% and 0.5%, respectively). The optometrists and the orthoptist were more likely to prescribe glasses than the ophthalmologist, whereas the ophthalmologist was more likely to prescribe follow-up examination (see Table 2).

Table 2: *Frequency of children by management category (no treatment, glasses, follow-up, and referral)*

	Treatment (% of participants)				
	No treatment	Glasses	Follow-up	Referral	Total
Optometrists	75.6	8.5	14.6	1.4	100
Ophthalmologist	76.5	3.8	19.2	0.5	100
Orthoptist	71.0	6.7	15.7	6.7	100

The children found to have amblyopia (n = 4), were prescribed glasses by all three eye care professions. The orthoptist would refer three of these children to the ophthalmologist, whereas both the optometrist and the ophthalmologist agreed that follow-up could be done by the optometrist. For the children with suspected pathology (n = 2), all three eye professions agreed that referral to an ophthalmologist was the correct management.

For the children that were discharged after the NCOVE examination with no further management planned (n = 160), the ophthalmologist recommended prescribing glasses to one child, and follow-up for 16 children. The orthoptist recommended follow-up for 20 children. Thus, there was agreement in 89.4% of cases between ophthalmologist and optometrists and in 87.5% of cases between orthoptist and optometrists.

Discussion

This study found that vision screening at the CHC reliably detected children with amblyopia and suspected pathology, thus the screening fulfilled its purpose given by the national guidelines.

The screening was moderately sensitive in detecting children who required glasses or follow-up of their vision due to refractive errors. This means that not all children with the need for glasses or follow-up will be detected by the mandatory vision screening programme for 4–5-year-olds. Specificity was moderate, due to a fairly high number of false positives, and, hence, a substantial proportion of children would be unnecessarily referred to specialist health professionals. Based on the calculated sensitivity and specificity, this study cannot conclude that vision screening in its current form is reliable in detecting refractive errors. This is in line with current opinions and summaries in the area (Evans et al., 2018; Jonas et al., 2017).

There was a considerable difference between the VA measurements performed by the school nurses compared to the paediatric optometrists. This is not surprising, given the fact that optometrists are trained to perform VA testing and that paediatric optometrists are particularly experienced in performing this test even in young children. The fact that there was no proportional bias in the measurements suggests that the school nurses report variable results. This may be because several school nurses were involved in data collection, and their individual approach may have varied. Nevertheless, that results from the VA testing vary with the professional's experience have been documented by others (Nisted et al., 2019), and this finding supports the opinion that normative population based studies should use eye care professionals when measuring VA. VAs measured by the optometrists in this study were poorer than those found in a study from Denmark in a similar population (Sandfeld et al., 2018). However, in the Danish study VA was measured at a shorter distance (3 m instead of 6 m), which offers an explanation to better VA results. Even though the size of the optotypes is scaled to the distance, and hence angular size would be the same for the two distances, it has been reported that visual acuity in children can be dependent of test distance, thus a shorter distance can result in better measures (Rozhkova et al., 2005). Also, in the study from Denmark, Kay Pictures were used, which have been shown to result in better VA measurements compared to Lea Symbols (Anstice et al., 2017).

Strabismus was present in 0.5% of the children, which is slightly lower than expected. Previous studies have reported a prevalence of strabismus in 4–5-year-olds of 2.4% in Bradford, United Kingdom (Bruce & Santorelli, 2016), and of 3.3% in white Caucasian and 2.1% in African American children aged 6–71 months in the greater Baltimore area in the USA (Friedman et al., 2009). Amblyopia was found in 1.9% of the children, which is similar to previous reports (Friedman et al., 2009). Seven children did not participate in the study because they were already being managed by the eye care services. Vision status in these children is unknown, but it is likely that some of these have been diagnosed with strabismus and amblyopia at an earlier age.

Ocular pathology is rare in this age group. Recently, a report from the United Kingdom presented data from 5706 children aged 4–5 years screened by orthoptists, and here only four (0.07%) children had ocular pathology (Horwood et al., 2021).

Most children in this study had hypermetropia of +1.00 D or higher. The frequency of hypermetropia of +3.00 D and higher was 6.3% in this study, which is similar to a Danish study reporting hypermetropia in 7.9% of children around the age of 5.5 years (Sandfeld et al., 2018). Similarly, none of the Danish children had myopia of -0.5 D or lower, compared to only two in this study. It is expected that the ratio of hypermetropia to myopia is higher in younger age groups, but two studies have reported that a high percentage of hypermetropia is persistent in Scandinavian school children and adolescents: Falkenberg et al. (2019) found that in children aged 7–15 years who were referred from school vision testing, 51% were hyperopic (SER ≥ +0.50 D), 32% were emmetropic and 17% myopic (SER ≤ -0.50 D). Another Norwegian study in 16- to 19-years-olds found that more than 50% had hypermetropia (SER ≥ +0.50 D) (Hagen et al., 2018). These Scandinavian results contrast with studies from other parts of the world where the prevalence of hypermetropia is smaller (Dirani et al., 2010; Goh et al., 2005; He et al., 2009). This study adds to the established knowledge that hypermetropia is present in Norwegian children from an early age.

To the authors' knowledge, this is the first study to explore the agreement on diagnosis and treatment between eye care professionals for children in this age group. Previous studies in Norway reviewing relevance of optometrists' diagnoses and referrals to ophthalmologists have shown similar levels of agreement (80–85%), but these studies have included patients in all age groups (Lundmark & Luraas, 2017; Riise et al., 2000). Further, this study establishes that collaboration between professions is possible and useful using a digital communication tool. The high level of agreement between the different eye care professions is encouraging. Here, all eye care professionals had clinical experience in testing young children, and there were predefined criteria following international clinical guidelines for prescribing corrective lenses (Leat, 2011). Still, there was some disagreement between professions with regards to prescribing glasses and follow-up. This discrepancy may be due to a small number of children having borderline refractions for requiring glasses according to the guidelines and thus affecting clinical judgment. There was no disagreement on the cases with suspected pathology or amblyopia.

The participation rate was high throughout the study period and the population is similar to the rest of Norway, but generalising these results to a wider population cannot be done without further consideration. It is possible that the proportion of children not participating may have contributed to the distribution of amblyopia, strabismus, or significant refractive errors. Inclusion of those not participating because they were already in the specialist health system may have skewed the distribution towards slightly higher frequencies, while the remainder not participating may or may not have vision anomalies. Hence, it is impossible to speculate on a possible change in outcome. However, VA in the non-participation group at the CHC was better than in the group participating, and relatively more children passed the screening criteria. Another possible explanation is that their parents chose not to participate because they were reassured that their child's vision was normal from the screening at the CHC. Taken together, this study sample is representative for Norwegian children aged 4–5 years.

In this study, vision screening of 4–5-year-old children by nurses at community health centres reliably detected children with amblyopia and most children with refractive errors. The digital communication tool used in this study enabled the paediatric optometrists to manage all children referred from the community health centres. The optometrists prescribed the appropriate treatment (glasses or follow-up) and referred the children to specialist health services when necessary. Even though the study showed that most children in this age group do not need glasses or further treatment, it confirmed, importantly, that most children can be managed by optometrists. Using paediatric optometrists as the referral body for the community health centres has the potential to relieve the specialist eye health service and ensure that children may receive treatment faster. A digital communication tool as used in this study can improve the accessibility to eye care for children.

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Evaluering av synsscreening av barn og digitale henvisningsrutiner i et tverrprofesjonelt samarbeid i Norge

Sammendrag

Godt syn er svært viktig for normal utvikling, og det å sikre god synsfunksjon hos barn er ett av FNs bærekraftsmål. De fleste land har synsscreeningsprogram for barn, og i Norge utføres synsscreening av barn i alderen 4–5 år ved helsestasjoner i kommunene. Spesialisthelsetjenesten ved oftalmologer og/eller ortoptister er henvisningsinstanser. Tilgangen til disse tjenestene kan imidlertid være begrenset og langt unna barnets hjemsted, mens optikere ofte er lokalisert nærmere og er mer tilgjengelige. Formålet med denne studien var å undersøke om synsscreeningen avdekker synsfeil, og å finne ut om bruk av optikere som henvisningsinstans kan avlaste spesialisthelsetjenesten. Studien ser også på forekomsten av brytningsfeil i denne aldersgruppen og videre håndtering av barna. Av de 274 barna som var på synsundersøkelse ved helsestasjonen i Kongsberg, Norge, samtykket foreldrene til 213 (77,7%) barn til full synsundersøkelse utført av en optiker med særskilt kompetanse i synsundersøkelse av barn. Samsvar mellom resultatene fra helsesykepleier og optiker ble evaluert. En øyelege og en ortoptist vurderte journalene fra synsundersøkelsene hver for seg ved hjelp av et digitalt kommunikasjonsverktøy (Eyecheck System AS) og samsvar i diagnoser og behandlingsbeslutninger mellom optiker og spesialisthelsetjeneste ble evaluert. Amblyopi og øyesykdom ble funnet hos 1,9% av barna, og disse ble identifisert ved synsscreeningen. Synsscreeningen hadde en sensitivitet og spesifisitet på henholdsvis 62,3% og 58,6% for å oppdage andre synsfeil som trenger behandling eller oppfølging. Hypermetropi var til stede hos 82,7% av barna (58,0% lav, 18,5% moderat, 6,5% høy hypermetropi), 16,4% var emmetrope og 1,0% var myope. Briller ble foreskrevet til 8,5% av barna, og 16,4% ble satt opp til oppfølgingskontroll. Det var høy grad av enighet om behandling mellom optikerne og spesialistene (oftalmolog 80,3%, ortoptist 81,7%).

Synsscreeningen avdekket amblyopi og øyesykdom, samt de fleste synsfeil som trenger behandling eller oppfølging. Den høye graden av samsvar mellom de tre øyehelseprofesjonene tyder på at optikere med særskilt kompetanse i synsundersøkelse av barn kan være henvisningsinstans for denne aldersgruppen. Tilgjengelighet av digitale kommunikasjonsverktøy gir god støtte til optikerne i beslutningstakingen og kan bidra til å avlaste spesialisthelsetjenesten ved å gi barna en synsundersøkelse og synskorreksjon tidligere og på en enklere måte.

Nøkkelord: synsscreening, barn, amblyopi, hypermetropi, brytningsfeil

Valutazione dello screening visivo pediatrico e delle routine di invio digitale al medico in un contesto interprofessionale in Norvegia

Riassunto

La visione è cruciale per lo sviluppo infantile e garantire una buona vista nei bambini è uno degli obiettivi di sostenibilità delle Nazioni Unite. Molti paesi hanno un programma di screening visivo infantile e, in Norvegia, lo screening nei bambini di età compresa tra 4 e 5 anni viene effettuato nei centri sanitari comunitari (CHC). I servizi sanitari specialistici come l'oftalmologia e/o l'ortottica sono le figure sanitarie di riferimento. Tuttavia, l'accesso a questi può essere limitato e possono trovarsi a grande distanza dalla casa del bambino, mentre gli optometristi sono spesso più disponibili e accessibili. Questo studio mira a indagare se lo screening visivo rileva in modo affidabile i problemi di vista e a esplorare se l'uso dell'optometria pediatrica come ente di riferimento può alleggerire i servizi sanitari specialistici. Lo studio mira anche a riportare la frequenza degli errori di rifrazione e la gestione dei problemi visivi in questa fascia di età.

Dei 274 bambini che hanno partecipato allo screening visivo effettuato dall'infermieria scolastica presso il CHC a Kongsberg, Norvegia, i genitori di 213 (77,7%) hanno acconsentito a un esame separato degli occhi e della visione effettuato da un optometrista pediatrico. È stato valuto il grado di accordo dei risultati dello screening fatto dalle infermiere scolastiche e dagli optometristi pediatrici. Separatamente, un oftalmologo e un ortottista hanno valutato i dati clinici degli esami visivi tramite uno strumento di comunicazione digitale (Eyecheck System AS), ed è stato valutato il grado di accordo nelle diagnosi e nelle decisioni di gestione tra optometristi e servizi sanitari specialistici.

Nell'1,9% dei bambini sono state riscontrate ambliopia o patologie oculari, tutti identificati dallo screening visivo. Lo screening visivo aveva una sensibilità e una specificità rispettivamnte del 62,3% e del 58,6%, nel rilevare altri problemi visivi che necessitassero di trattamento o follow-up. L'ipermetropia era presente nell'82,7% dei bambini (58,0% bassa, 18,5% moderata, 6,5% alta ipermetropia), il 16,4% aveva emmetropia e l'1,0% miopia. Gli occhiali sono stati prescritti all'8,5% dei bambini e al 16,4% è stato un appuntamento di controllo per follow-up. Il livello di accordo nella gestione tra optometristi e specialisti è considerabile elevato (oftalmologo 80,3%, ortottista 81,7%).

Lo screening visivo ha rilevato in modo affidabile ambliopia e patologia oculare, ed è stata rilevata la maggior parte degli errori di rifrazione. L'alto grado di accordo tra le tre professioni che afferiscono alla visione suggerisce che l'optometrista pediatrico può essere utilizzato come figura professionale di riferimento per questa fascia di età. La disponibilità di uno strumento di comunicazione digitale fornisce supporto agli optometristi pediatrici nelle loro decisioni e può aiutare a alleggerire i servizi sanitari specialistici fornendo ai bambini un esame oculare e una correzione visiva più precocemente e più facilmente.

Parole chiave: screening visivo, bambini, ambliopia, ipermetropia, errori refrattivi