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Small Refractive Errors – Their Correction and Practical Importance

Matej Skrbek and Sylvie Petrová

Department of Optometry and Orthoptics, Masaryk University, Faculty of Medicine, Brno, Czech Republic

A B S T R A C T

Small refractive errors present a group of specific far-sighted refractive dispositions that are compensated by enhanced accommodative exertion and aren't exhibited by loss of the visual acuity[1]. This paper should answer a few questions about their correction, flowing from theoretical presumptions and expectations of this dilemma. The main goal of this research was to (dis)confirm the hypothesis about convenience, efficiency and frequency of the correction that do not raise the visual acuity (or if the improvement isn't noticeable). The next goal was to examine the connection between this correction and other factors (age, size of the refractive error, etc.). The last aim was to describe the subjective personal rating of the correction of these small refractive errors, and to determine the minimal improvement of the visual acuity, that is attractive enough for the client to purchase the correction (glasses, contact lenses). It was confirmed, that there's an indispensable group of subjects with good visual acuity, where the correction is applicable, although it doesn't improve the visual acuity much. The main importance is to eliminate the asthenopia. The prime reason for acceptance of the correction is typically changing during the life, so as the accommodation is declining. Young people prefer the correction on the ground of the asthenopia, caused by small refractive error or latent strabismus; elderly people acquire the correction because of improvement of the visual acuity. Generally the correction was found useful in more than 30%, if the gain of the visual acuity was at least 0,3 of the decimal row.

***Key words**: asthenopia, hyperopia, refractive errors, visual acuity*

Introduction

Today's life, typical by fast progress in computer and communication engineering, road traffic, etc. requires higher performance of our vision as well as refractive examination and correction accuracy. The usual standard of value of the visual efficiency is expressed by visual acuity. But there are some refractive errors, which can affect the vision performance, although they do not decrease the visual acuity. We call them »small refractive errors«[1]. It's generally known that these problems do exist, but there wasn't published much in present literature about this.

Small refractive errors theory

The presumption of qualification of an eye refractive error as a small is, that it's compensable by spontaneous increased effort, this means by accommodation. It appears from this that possible refractive statuses are hypermetropia and partly hypermetropic composite astigmatism with dominant spherical part. The main role in differentiation between a »small« and a »large« refractive error doesn't fall on its dioptrical value, but it's depending on amount of compensation processes pool (it means accommodation range)[2]. It's evident that an identical refractive error will manifest quite variously in two different subjects, owing to their unequal accommodation amplitude. Thereby we can expect that there also won't be stable manifestation of the small refractive error during one subject's life. Another distinction of small refractive errors is their (largely) latent course. If the accommodative compensation is sufficient, the small refractive error may not be uncovered for a long part of life. However in the period of small refractive errors manifestation (caused by declining accommodation ability) their detection and proper correction isn't obvious, because of their non-specific symptoms, accompanying many other complaints.

Latent strabismus is also closely associated with the small refractive errors theme. There may not be present

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any loss of visual acuity as well as in the case of uncorrected hypermetropia and its course can be hidden for a long time. The role of compensative mechanism represents fusion – whether sensoric or motoric. Thanks constant interconnection between accommodation and (con)vergency, we can't separate small refractive errors and latent strabismus absolutely. The total concept for both of the topics could be »small eye errors«.

The origin of small refractive errors

The aetiology and incidence of small refractive errors basically copies the evolution of eye refraction and aren't anything unusual in the population. Average refraction values of new-born child lies between +2,0D and +4,0D[3–5]. Although there's an inclination to the emmetropisation[5] in process of adolescence on grounds of growth of the eyeball, it's statistically evaluate that the great deal of persons remains hypermetropic for whole life, this means the eye refraction never reach zero or negative values[6]. In contrast to short-sighted ones, who can't compensate the refractive error of their eyes, there is usually a non-problematic compensation of lower hypermetropia by the help of higher accommodation effort (it means facultative hypermetropia = manifest hypermetropia). This could lead to an image of emmetropia[1]. The manifestation of small refractive errors hangs together with depletion of their compensative capabilities. Depending on the size of hypermetropia and the accommodation range it represents a quite wide age interval (from a middle of third to fifth decennium)[2]. Slow decompensation of small refractive errors could often progress so imperceptible and without subjective sensible changes that their discovery can be done quite accidental in context of an examination of another eye function(s).

Symptomatology of small refractive errors

As mentioned above, the symptoms of uncorrected small refractive errors are quite non-specific and could be often confused with manifestations of other diseases or refractive abnormalities. It is also evident that many of small refractive error symptoms can have really negative influence on vision and whole life, if not solved for a longer time.

Visual acuity. The decrease of visual acuity is usually minimal (if ever) due to uncorrected small refractive errors[1], but their compensation ability won't be always absolutely stable and can oscillate even during shorter periods (acute illness, medicamentous inhibition of accommodation, wrong way of living – stress – and ergonomics of vision…). In case of marginal compensated small refractive errors we can expect transitory manifestation by lower visual acuity with successive (at least temporary) rehabilitation. In connection with progressive loss of amplitude of accommodation, hypermetropia is being decompensate (shift from facultative to absolute) and the visual acuity is sinking (at first into near and then into far distances as well)[7].

Binocular vision disorders. Because of interconnection of accommodation and convergence (in so-called accommodative-vergent-synkinesis)[8] uncorrected small refractive errors can secondary manifest in binocular disorder. Mainly it leads in accommodative esophoria in far[9], which results in transversal displacement of the retinal image from the spot of the sharpest vision[7]. This state is being overcome by increased fusion effort, it means by motoric (fusion vergency) as well as sensoric fusion, when the evolution of fixation disparities of dif ferent degrees is facilitated[10]. Blurred vision and eventually diplopia is usually present in such cases, when the value of phoria has reached margins of subject's compensatory mechanism (fusion). The transversal displacement of retinal image represents the greatest risk to children, whose binocular vision hasn't been fully fixed yet. It should be anticipated the possibility that accommodative esophoria could evolve into manifest strabismus, inhibition process resulting in amblyopia could appear and if it isn't diagnosed and solved early, restrictive results can remain[7]. The modification of AC/A rate in uncorrected hypermetropes[11] seems to work as a protective process against this (less convergency in comparison to higher accommodative effort)[2]. The rate of accommodative esophoria may not be the same on near and far distances and also excesses of convergency can appear, etc. Analogical, problems similar to them, originating from uncorrected small refractive errors, are present for example in exophoria, compensated by accommodative convergency[12]. The connection between small refractive errors and latent strabismus is evident and it would be incorrect to solve these separately.

Asthenopia. Asthenopia presents the most common symptoms of small refractive errors[3]. Its source is disproportion between the range of the compensation mechanism and the size of the small eye error[2]; it means too low accommodation »pool« in case of uncorrected hypermetropia, and too small fusion reserve in subjects with latent strabismus[9]. Usually asthenopia appears, if the value of hypermetropia exceeds 2/3 of actual accommodation reserve[2], but it shouldn't be thought dogmatically; treatment of each subject has to be individual. Presence of asthenopia is an explicit indication of correction of small refractive error[1].

Generally, we classify asthenopic problems based on their symptoms onto visual (blurred and unfocused vision, impairment of stereoscopic vision, diplopia)[1,3,9], ocular (various forms of pain – perceived in or behind eyes, photophobia, flare and inflammations of eyelids, etc.)[1–3] and additional (untypical headaches, sometimes leading even to nausea, etc.)[1,3,9]. It's obvious that many of these symptoms can be mistakenly associated with a different diagnosis (and contrariwise). Proper differential diagnosis, including a complex optometristic examination, could help to a successful solution of many of dispositions, e. g. some neuralgic pains, blepharitis, photophobias, etc., if their source was an uncorrected small refractive error.

Reading and writing disorders.In some studies, there was proved that reading and writing disorders (often mentioned as *legasthenia*) may be related to aggravated visual functions, often an undetected, uncorrected and

unsolved small refractive (or eye) error. For example on the basis of a research from Germany (Motsch, Mühlendyck, 2000) it was found out that over 84% of the children in a sample population with reading and writing disorders was suffering from an undetected eye error and that in 78% of cases the difficulties have regressed after an application of its adequate correction or treatment. Uncorrected hypermetropia was present in 10% of cases and whole half of them represented exophoria, compensated by accommodative convergence, 33% accommodation insufficiency and the rest were different forms of undetected strabismus[12]. It is important to highlight that the visual acuity at distant vision of all subjects was normal (exactly as the definition of small refractive / eye error is), so there is a real risk of leakage of such children through the system of periodic paediatric check-ups, checking only visual acuity (moreover usually only monocular). The incorrect diagnosis of legasthenia is threatening!

Correction of small refractive errors

The principle of small refractive errors correction is resulting from basic standards of correction of hypermetropia. Aren't there any unusual individual reasons (intolerance), is advisable to apply full sphero-cylindrical correction of the refractive error[2]. If there is a suspicion that subject's problems may hang together with latent strabismus and if it's possible, the full binocular correction (incl. prism) is in place[9,13,14]. The under-correction isn't recommendable; mostly we just achieve the best visual acuity, but we don't ease of the compensational effort (accommodation, eventually fusion), so that the problems related with small refractive errors won't be avoid, but just will appear later (especially for near vision).

Indication of correction is explicit, if there are any symptoms of small refractive errors mentioned above[1]. It's advised to make a differential diagnosis, if the source of problems is multivalent. There should be excluded any influences of general or eye diseases via a medical / ophthalmologic examination or incidence of a small refractive error by the help of an accurate optometristic examination. In the event of suspicion of accommodation spasm and an appearance of esophoria together it's suitable to use classical hypermetropic sphero-cylindrical correction to relax the spasm, if there is no possibility to induce cycloplegia pharmacologically. This could also disprove / confirm eventual connection between esophoria and accommodative activity. In case of accommodative esophoria the correction of the small refractive error (hypermetropia) should remedy the disposition. If not and the esophoria remains it's advisable to think over prismatic correction. Subjects without any problems, which could be caused by a small refractive error, can stay without correction, if the compensation proceeds adequately[1].

The practical importance of correction of small refractive error was verified in the research. Its results are mentioned below.

The study of the practical importance of correction of small refractive errors

In 2009, there was realized a research on a group of clients of an optometric workplace to describe the real contribution of correction of small refractive errors. This implies that the surveyed sample doesn't match exactly to a common population, but it's focused on people coming for an optometric eye examination of their own will (mostly because of different vision difficulties). There were invited some more subjects, who wouldn't visit our workplace yet, to join the study to help us to describe (at least partly) the situation among people, who account themselves »emmetropic«.

The objectives of study

The results of the research should help to answer 3 main questions:

1. When (if any) is the correction of small refractive errors beneficial, although it doesn't rise the visual acuity significantly?
2. Does any dependence of incidence and symptoms on age exist?
3. What difference between corrected and uncorrected visual acuity is big enough to persuade the subject of acquisition of the correction (spectacles, contact lenses). The prerequisite is a good uncorrected visual acuity.

Methods and Subjects

The standard optometric examination of our clients (including objective and subjective measurement of the eye refraction, binocular examination for distance and near vision using for the distance vision the »Mess- und Korrektionsmethodik nach Haase« (MKH) methodics with positive polarisation and negative polarisation tests for near vision and assessment of the addition for near vision) was done. Based on outcomes of these measurements the subjects were divided into different groups described below.

Definition of the subject with small refractive error

It was necessary to set up unambiguously parameters what refractive error is small and what no more. There were determined 3 sections, in which the subjects must correspond to the next 3 conditions:

1. At least one eye must have refraction with positive spherical equivalent and the spherical equivalent (SE) of the second eye mustn't be negative. It's expectable that such refractive error could be at least partly redeemable by increased accommodative effort.
2. The binocular visual acuity without correction must reach at least 0,9. Uncorrected visual acuity of one eye can be lower, if the subject would fulfil the conditions for binocular visual acuity. It's a bit difficult to define the small refractive error exactly at this point, because even in patients with lower binocular visual acuity we can talk about small refractive error, if it isn't possible to achieve better visual acuity after correction of hypermetropia.

For example young one with bilateral impaired visual acuity (without correction right eye (*oculus dexter*, OD) 0,6; left eye (*oculus sinister*, OS) 0,6; binocular 0,6; with full correction +3,0D binocular also OD 0,6; OS 0,6, binocular 0,6). It would seem like a bilaterally amblyopia, the accommodative compensation does proceed, but the visual acuity stays permanent lower.

3. The subject didn't suffer from any serious eye disease, which could affect results of the research. Probably, the visual acuity of such people would be lower than the 2nd condition requires.

242 people joined to the primary research (133 females and 109 males). The structure of the group is shown in the next figures (Figure 1 and 2).

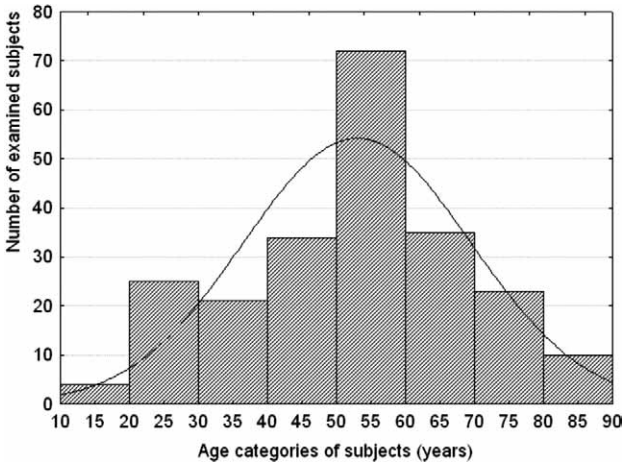

Fig. 1. Age structure of the basic group of subjects.

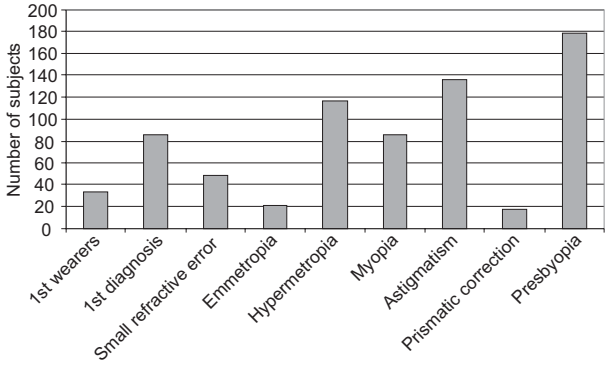

Fig. 2. The basic group of 242 subjects. Comments: 1st wearers = subjects that provided their first spectacles for distant vision after the examination; 1st diagnosis = in those subjects was for the first time diagnosed some refractive error during the examination; Small refractive error = number of people, which fulfil the conditions mentioned above; Emmetropia = subjects with refraction exactly 0,0D on both eyes; Hypermetropia = subjects with hypermetropia or hypermetropic composite astigmatisms; Myopia = subjects with myopia or myopic composite astigmatism; Astigmatism = number of people with any form of astigmatism (at least 0,25D of astigmatic difference at least on 1 eye); Prismatic correction = subjects with combination of sphero-cylindrical and prismatic correction;Ppresbyopia = all subjects with addition 0,25D and higher for near vision.

The basic group of examined subjects

Most of the examined people were hypermetropic (48% with hypermetropia or hypermetropic astigmatism against 35% myopic or with myopic astigmatism). This is wholly in correlation with numbers, mentioned in literature. 56% of examined had some form of astigmatism. Small refractive error was represented in one fifth of all cases (20,25%) (Figure 2).

The group of small refractive errors

49 of 242 probands matched the requirements to be classified as a man with a small refractive error. 27 of them were female and 22 male. Details are shown in the next figures (Figure 3, Table 1):

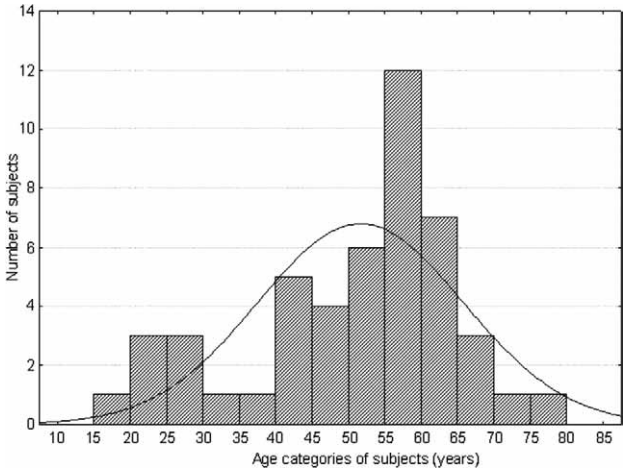

Fig. 3. Age structure of the group of subjects with small refractive error.

The age structure of the group with small refractive errors basically copied the curve of the basic group and was affected by 2 facts: firstly due to exclusion of people under 15 years old, secondly on grounds of voluntary participation on our study – mainly we were visited by clients, which wanted to solve some »problems« with their sight (mostly presbyopia). It's expectable that in the case of a real random sample the representation of single age categories with small refractive error would be more regular.

The average value of the spherical equivalent was +0,56D (maximum +2,63D) on the right eye and +0,47D (maximum +4,38D) on the left eye. The average visual acuity without correction reached 1,10 on the right and 1,16 on the left eye; binocular 1,24. With correction it grew up to 1,38 monocular and 1,5 binocular. Average addition for near vision was 1,59D.

Results

The statistical evaluation and analytical study were replenished with another three marks that represents directly subjective decision of examined people: »the cor-

TABLE 1
SUMMARY OF DESCRIPTIVE STATISTICS OF THE GROUP REPRESENTING SUBJECTS WITH SMALL REFRACTIVE ERROR

	Numer of valid	Average	Median	Minimum	Maximum
Age (years)	48	51.46	55.50	20.00	78.00
Sph R (D)	49	0.64	0.50	0.00	2.75
Cyl R (D)	20	–0.39	–0.25	–1.00	–0.25
SE R (D)	49	0.56	0.50	0.00	2.63
Prism R (pD)	6	0.95	0.75	0.25	2.50
Sph L (D)	49	0.58	0.50	0.00	4.50
Cyl L (D)	24	–0.43	–0.25	–1.25	–0.25
SE L (D)	49	0.47	0.25	0.00	4.38
Prism L (pD)	6	0.95	0.75	0.25	2.50
Vis. nat. R	49	1.10	1.00	0.40	1.50
Vis. nat. L	49	1.16	1.20	0.50	1.50
Vis. nat. bino	49	1.24	1.20	0.90	2.00
Vis. c. c. R	49	1.38	1.50	0.70	2.00
Vis. c. c. L	49	1.38	1.50	0.80	2.00
Vis. c. c. bino	49	1.50	1.50	1.20	2.00
Vis. difference R	49	0.27	0.30	0.00	0.80
Vis. difference L	49	0.22	0.20	0.00	1.00
Vis. difference bino	49	0.26	0.30	0.00	0.60
Addition (D)	39	1.59	1.75	0.25	3.00

Values of cylindrical correction are mentioned in a negative form and statistically interpreted pure mathematically (it means cylinder –1.25 D represents lower value than –0.25 D). Because of this, the values of spherical rate of refractive errors seem to be higher due to compensation of negative values of cylinder (the spherical equivalents stay unmodified). Abbreviations: Sph R = value of spherical part of the refractive error on the right eye; Cyl R = cylindrical part of the refractive error on the right eye; SE R = value of spherical equivalent on the right eye; Prism R = value of prismatic correction on the right eye; Sph L = value of spherical part of the refractive error on the left eye; Cyl L = cylindrical part of the refractive error on the left eye; SE L = value of spherical equivalent on the left eye; Prism L = value of prismatic correction on the left eye; Vis. nat. R = visual acuity of the right eye without correction; Vis. nat. L = visual acuity of the left eye without correction; Vis. nat. bino = binocular visual acuity without correction; Vis. c. c. R = visual acuity of the right eye with correction; Vis. c. c. L = visual acuity of the left eye with correction; Vis. c. c. bino = binocular visual acuity with correction; Vis. difference R = the difference between visual acuity of the right eye with and without correction; Vis. difference L = the difference between visual acuity of the left eye with and without correction; Vis. difference bino = the difference between binocular visual acuity with and without correction.

rection accepts«, »the correction considers« and »the correction refuses«. Totally, there were 27 marks and their relations pursued in the study.

The results of assessment of helpfulness of the correction by means of the clients themselves were very interesting (Figure 4 and 5). Immediately after the examination 36,7% of subjects decided to purchase the correction utility (spectacles), 10,2% thought about it and 53,1% rated it as needless. It's necessary to remark that the decision of 36,7% of subjects to acquire the correction meant to buy (and pay for) spectacles or (at least) spectacle lenses. The decision wasn't just in the purpose »do I like the vision with this correction?«, but it could be interpreted as »is the vision with the new correction such beneficial for me that I'll spend my money for it?«. Off course, the economic aspect could play a role in the opposite reaction too; some people liked the vision with correction of small refractive error, but weren't disposed to pay for it (this opinion is best expressed in the mark »Considers the correction«).

The graph (Figure 5) shows the opinions of the examined people, why to buy glasses with correction of small

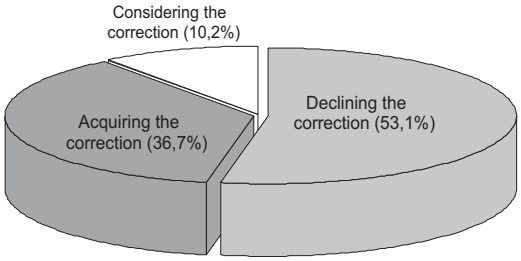

Fig. 4. Subjective opinions of the examined group with small refractive errors after the examination.

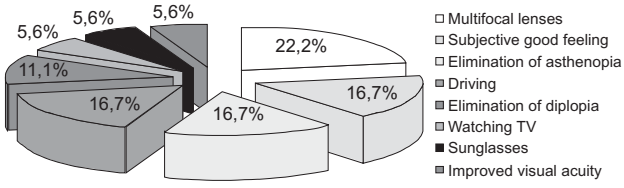

Fig. 5. Reasons for acquisition of the correction of small refractive error.

refractive errors. Although the subjective reasons are individually entitled different, the causes could be the same (improved visual acuity, watching TV, driving, sunglasses – in these cases is the greatest benefit better visual acuity than without any correction).

Thanks the evaluation of reciprocal correlation of surveyed signs we were able to find out that the most important factor for acquiring the correction is the improved visual acuity. Even if the growth of visual acuity was relatively small (about 0,3), the correction bought about 30% people of the group just because of better visual acuity. The rating of the correction wasn't depending on subject's age. The positive correlation with the size of ametropia was expectable. Mostly the correction was acquired by people with marginally compensated refractive errors or with fully manifested refractive errors which sank the visual acuity without correction to the values about 0,9 (this means to the limit of acceptation to the study).

Through the use of the aggregation analysis it was able to sort the subjects into a couple of groups with similar marks in relation to the refractive error and its correction (Table 2). We can state that the least people tend towards the correction of small refractive errors in middle and elder-middle age if their binocular visual acuity was very good (1,4 binocular) and spherical equivalent low (up to +0,5D). In these cases the correction was acquired only in combination with prismatic correction of latent strabismus. On the other hand, the highest effect (80%) of the correction was found in the oldest group with similar size of refractive error, but uncorrected visual acuity about 0,9 – 1,0 and improvement to the average values 1,32 with correction. The main reason for purchase of this correction was increasing of visual acuity. The youngest group of subjects had a specific access to the correction of small refractive errors. In the cases with low grade of hypermetropia, its sufficient compensation and good visual acuity without asthenopia, there

TABLE 2
AVERAGE VALUES OF SURVEYED MARKS IN SINGLE GROUPS ORDERED BY AGE

	1st group	2nd group	3rd group	4th group	5th group
Age (years)	26.00	44.33	55.07	61.33	71.20
Sph R (D)	0.84	0.42	0.61	0.77	0.55
Cyl R (D)	–0.28	–0.11	–0.11	–0.13	–0.30
SE R (D)	0.70	0.36	0.55	0.71	0.40
Prism R (pD)	0.22	0.04	0.18	0.00	0.22
Sph L (D)	1.03	0.19	0.55	0.58	0.60
Cyl L (D)	–0.28	–0.11	–0.16	–0.23	–0.30
SE L (D)	0.89	0.14	0.47	0.47	0.45
Prism L (pD)	0.22	0.04	0.18	0.00	0.22
Vis. nat. R	1.20	1.24	1.09	1.01	0.98
Vis. nat. L	1.15	1.38	1.15	1.09	1.00
Vis. nat. bino	1.36	1.44	1.18	1.20	1.04
Vis. c. c. R	1.43	1.38	1.41	1.36	1.28
Vis. c. c. L	1.34	1.43	1.39	1.39	1.28
Vis. c. c. bino	1.65	1.52	1.45	1.56	1.32
Vis. difference R	0.23	0.13	0.32	0.35	0.30
Vis. difference L	0.19	0.06	0.24	0.30	0.28
Vis. difference bino	0.29	0.08	0.27	0.36	0.28
Addition (D)	0.00	0.56	1.63	1.79	2.10
The correction refuses	50.00%	66.67%	57.14%	58.33%	20.00%
The correction considers	0.00%	22.22%	7.14%	16.67%	0.00%
The correction accepts	50.00%	11.11%	35.71%	25.00%	80.00%

Greater decline in the uncorrected visual acuity (Vis. nat.) than with correction (Vis. c. c.) during the lifetime indicates that the compensation of small refractive error isn't stable in the time, although the refraction values don't change a lot in adult age. The highest values of refractive error are present at the first (youngest) group, in spite of the fact that the uncorrected visual acuity isn't anyhow worse that in the other groups. This is also a confirmation of active compensation effort. Abbreviations: Sph R = value of spherical part of the refractive error on the right eye; Cyl R = cylindrical part of the refractive error on the right eye; SE R = value of spherical equivalent on the right eye; Prism R = value of prismatic correction on the right eye; Sph L = value of spherical part of the refractive error on the left eye; Cyl L = cylindrical part of the refractive error on the left eye; SE L = value of spherical equivalent on the left eye; Prism L = value of prismatic correction on the left eye; Vis. nat. R = visual acuity of the right eye without correction; Vis. nat. L = visual acuity of the left eye without correction; Vis. nat. bino = binocular visual acuity without correction; Vis. c. c. R = visual acuity of the right eye with correction; Vis. c. c. L = visual acuity of the left eye with correction; Vis. c. c. bino = binocular visual acuity with correction; Vis. difference R = the difference between visual acuity of the right eye with and without correction; Vis. difference L = the difference between visual acuity of the left eye with and without correction; Vis. difference bino = the difference between binocular visual acuity with and without correction.

was the correction mostly declined. In principle they were most frequently invited to join the study, although they actually didn't suffer with any ocular illness or refractive error and probably wouldn't visit any eye-examination yet. By contrast, young people with higher hypermetropia (in spite of good or outstanding uncorrected visual acuity) with extended asthenopia sequent on accommodative compensation purchased the correction always immediately.

Conclusion

Survey of the subjects with small refractive error has answered to the questions, defined at the beginning:

1. When and even if ever is the correction beneficial, when it doesn't improve the visual acuity?

We can expect this form of correction only in the period before the manifestation of small refractive error with downturn of visual acuity. This correction has the greatest importance for young hypermetropes with higher, in the long term hardly compensated refractive error. It helps to relieve of asthenopia and creates optimal conditions for the best visual performance (dynamics of the sight far-near-far changeover, restoration of the AC/A rate, defer the need of the addition for near vision). Possible improvement of visual acuity (for example thanks correction of low grade of astigmatism) presents just an accessory advantage. In cases with associated symptomatic latent strabismus the prismatic correction was accepted across the whole age spectrum.

2. Does any dependence exist between age and incidence of small refractive errors?

The small refractive errors (in the interpretation, explained above) are occurring in youth and younger adult age, when the subjects can use their own accommodation to (at least partly) compensate their refractive error. There were also considerable elder ones included in the research, whose (former small) refractive error wasn't compensate any more, but visual acuity without correction didn't fall under the determined criterion.

3. How high difference between visual acuity with and without correction do the examined subjects rate as such substantive to acquire the correction?

It was find out that 30% subjects in this study did purchase glasses, if their visual acuity grew up by 0,3 (in the decimal row) due to correction of the (mainly already manifested) small refractive error. Generally, the reception of contribution of this correction is markedly individual. The uncorrected visual acuity 0,9 was for many people good enough, on the other hand there were some subjects in the study, who rated visual acuity 0,9 and better as insufficient, or they needed the correction in the sense of the first question / hypothesis. In general we can say that the correction of small refractive errors isn't significant in subjects not suffering from asthenopia and with binocular visual acuity at least 1,5.

On grounds of the small refractive errors research and its results we can bring together a few recommendations for practice:

- The approach to the correction of small refractive errors should be as individual as it is possible. Two equal refractive errors could manifest really differently even in two similar subjects.
- Appreciation of contribution of small refractive error is purely subjective and it's affected by quite a number of factors (among others social, economics, personal …). The examiner's (optometrist's or ophthalmologist's) purpose is to provide his client enough relevant information, details and recommendations, so that the client could compare the benefits and disadvantages of the correction by himself and make a decision, if it for him beneficial is, or is not. The possibility of correction should be offered at any time, but never forced on.
- The questions of small refractive errors shouldn't be underestimate, so as the correction above the 1,0 visual acuity values. In this study, there were 47% of examined confident about contribution of the correction and 37% of them purchased it immediately. The aggregation analysis has shown us that there were several subjects in every specific group (also in group with the best uncorrected visual acuity), which acquired the correction.
- The examination of eye refraction has to be done every time, although the visual acuity without correction can be good. Only in this case we're able to uncover possible small eye error that could cause a lot of less or more marked difficulties, which can negatively influence the quality of life. The prescription of the real value of the latent refractive error is also necessary to correct determination of actual addition, which is needful (for example) for successful wearing of degressive spectacle lenses.

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M. Skrbek

1. máje 78, 46604 Jablonec nad Nisou, Czech Republic
e-mail: matejskrbek@seznam.cz

MALE REFRAKCIJSKE GREŠKE-NJIHOVA KOREKCIJA I ZNAČAJ

S A Ž E T A K

Male refrakcijske greške tvore specifičnu skupinu koje se velikim dijelom mogu kompenzirati akomodacijom ili niskim vizusom. Glavni cilj ovog istraživanja je ustanoviti subjektivne smetnje koje su značajno prisutne u ovih bolesnika bez obzira na male refrakcijske greške. U mlađih bolesnika izraženija je astenopija kod nepotpune korekcije, dok su kod starije populacije izraženije smetnje u slučaju nepotpunog postizavanja oštrine vida.