

# Accommodation Values in a Normal Sydney Population, is the RAF Rule Still Valid?

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## Introduction

The evaluation of the dynamic components of the near response forms a major part of an assessment of a person who has symptoms for near, or who has difficulty in changing focus. The close association of accommodation with age means that measures obtained in a clinical assessment must be compared with age related normal values to determine whether or not any abnormality is present.

In Australia, the most commonly used instrument to assess accommodation is the RAF rule. This instrument has the advantage of being able to determine the amount of accommodation occurring (in dioptres) and to match this against age related values. It also enables a simple measurement of the accommodation and convergence near point (in cms). The 'normal' values indicated on this device are those determined by Duane in 1912<sup>1</sup>. These are taken from a comprehensive study of normal accommodation, where the near blur point was measured and converted to diopters, assuming that any refractive error was corrected. It is likely that the 'mean' values are actually median values as they are always exactly midway between the upper and lower values.

(See Figure 1).

Clinical norms must be matched to those of the relevant population, and, in an urban Australian society at the end of the 20<sup>th</sup> century, the question must be asked as to whether values determined over eighty five years ago are still appropriate to use as normal for our population.

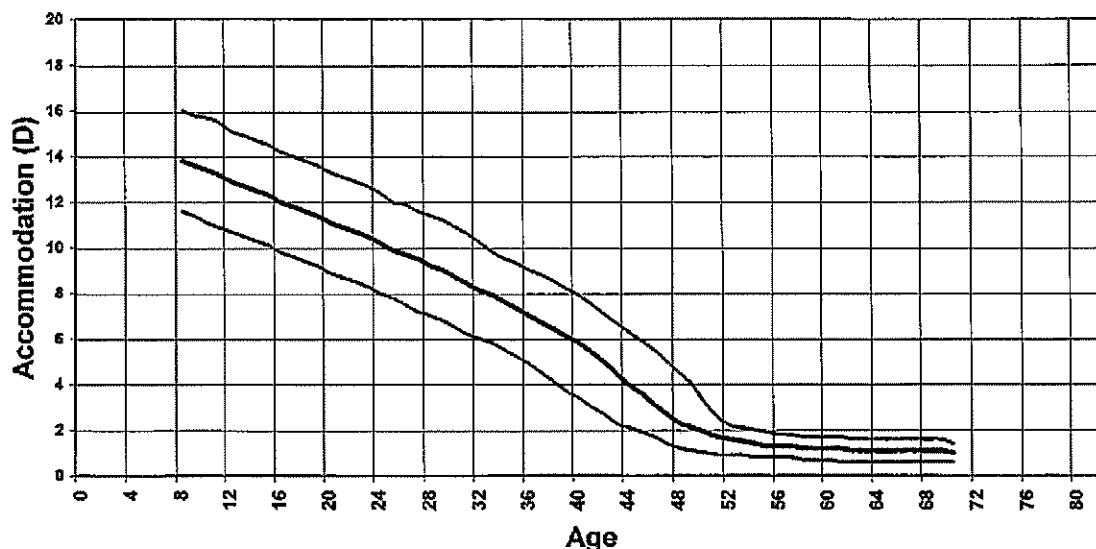


Figure 1. Duane's normal values of accommodation for age measured in 1912.<sup>1</sup>

Borish<sup>2</sup> reports other studies which have been made on age related accommodation values, which are summarised in Table 1. Some measures are notably different from Duane's, possibly due to the different measuring techniques which were used (especially those of Donders in 1864). Even the most recent (Turner, 1958) was published forty years ago. It is likely that the subjects in these studies were mostly of western European origin, whereas the current urban Australian population (Sydney in this study) has significant numbers of citizens with other ethnic origins.

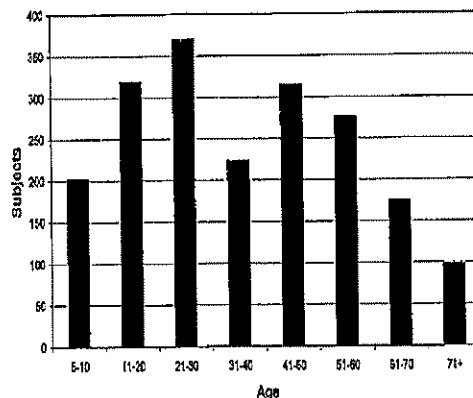
Different clinicians have different measuring techniques; for example, the speed at which the target is moved will influence the recorded near point of accommodation. Some clinicians take only one measure, others measure several times. Unless each examiner uses the exact techniques that were used by Duane, values that differ from his will not necessarily represent abnormalities. In determining general values that can be used by all, there is also merit having input by many examiners in the determination of normal values for a particular population of subjects and examiners.

**Table 1.** Summary of accommodation for age studies.

Age (Years)	Donders (1864)	Duane (1912)	Sheard (1917)	Jackson (1922)	Turner (1958)
0-10					
11-15	19.7	13.4	12.0	14.0	13.0
16-20	16.0	12.3	11.0	12.0	10.6
21-25	12.7	11.2	9.0	10.0	9.5
26-30	10.4	10.0	7.5	9.0	7.9
31-35	8.2	8.7	6.5	8.0	6.0
36-40	6.3	7.3	5.0	7.0	5.75
41-45	5.0	5.7	3.75	5.5	4.4
46-50	3.8	3.9	2.75	4.0	2.5
51-55	2.6	2.1		2.5	1.6
56-60	1.75	1.4		1.25	1.1
61-65	1.0	1.2		0.5	0.7
66-70		1.1			
71-75		1.0			
76-80					
81-85					

For these reasons, a study of accommodation values in the Sydney population was carried out to determine current standards, and to compare these findings with the commonly accepted norms.

**Figure 2.** Subject numbers in age categories.



## Method

The normal values of accommodation were measured in 1,978 subjects over a two year period (1995 -1996) by a total of 40 third year orthoptics students. These students had all been assessed as being competent in the appropriate measuring technique, and, in many cases, were supervised by a clinician during the testing.

## Subjects

Subjects were included if there was no known or suspected anomaly of the ciliary muscle or the lens. The following were exclusion criteria:

- aphakia (or pseudophakia)
- cataract
- known anomalies of accommodation (eg, accommodative spasm)
- medication which affects accommodation
- the squinting eye in unocular strabismus
- amblyopia

As normal values were needed, the examiners were encouraged to take measurements from a non-clinical population, ie from amongst their family and friends, and non patients in the clinics. Although attempts were made to achieve relatively similar subject numbers in all age groups it was inevitable that larger numbers were found from the young to middle age adult population. The presence of cataract also excluded many of the older subjects. Even so, 273 subjects over the age of sixty were assessed. The distribution of subjects is shown in Figure 2.

## Procedure

The RAF rule was used where this was available, using the incorporated reduced vision chart or the four lines of different sized near print. Where this was not available, a ruler was placed against the subject's infraorbital ridge and an accommodative target was brought towards the eye along the edge of the ruler. The near point was measured in centimetres and converted to dioptres (using the formula  $100/\text{cms}$ ).

The subjects wore appropriate distance correction. If there was any known undercorrection, the full distance correction was used. Where progressive lenses (or bifocals) were incorporated in the glasses, care was taken to ensure that the subject was looking through the distance section of the glasses. Where the near point was more remote than 50cms (the length of the RAF Rule), this distance was measured and the results converted to dioptres.

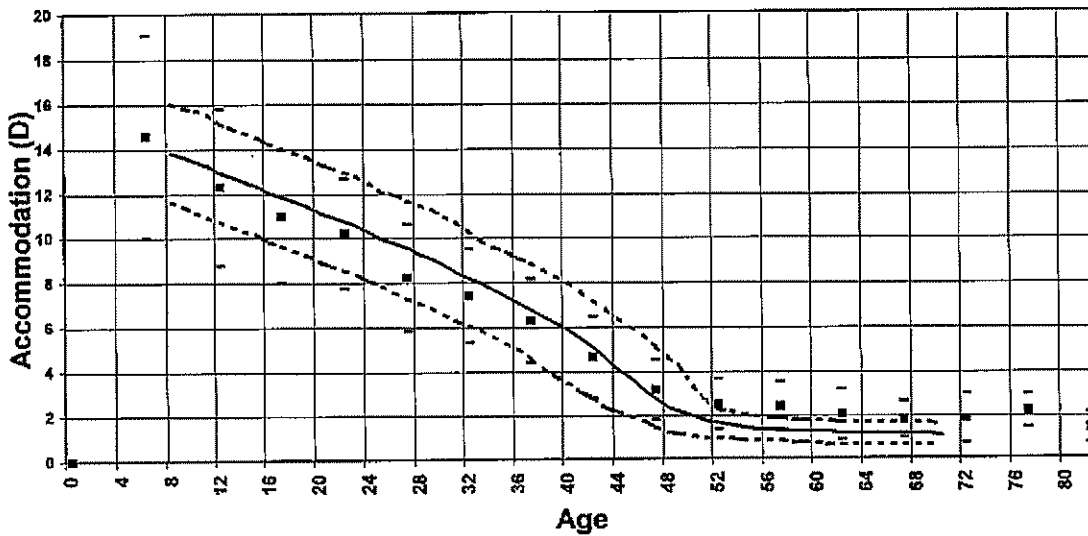
Each eye was assessed separately.

Results were recorded in the age groups, from six to ten years, and thereafter in five year age groups to age 85 years.

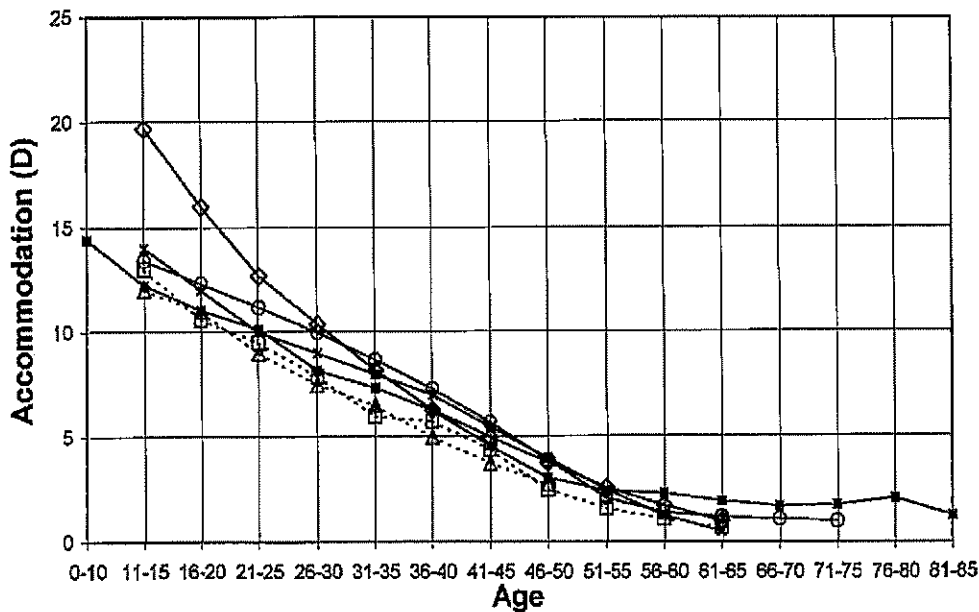
The subjects' initials, age and clinic code were recorded to detect any duplicate measurements. At the end of the relevant period, the data was analysed using EpiInfo and Minitab.

### Results and Discussion

Valid measures on 1,978 subjects were obtained. When right and left eyes were compared there was a statistically significant difference between the two eyes ( $t = -2.4$ ,  $p = 0.017$ ), however the actual difference of 0.57D is so small and clinically meaningless that it was decided to disregard it. The probable reason for the statistically significant difference was the very large sample size. (This is an example of a difference between practical and statistical significance.) The resulting data from each eye were therefore pooled.



**Figure 3.** Mean and SD of current study compared with Duane's values. Continuous and dotted lines show Duane's values. Current values are superimposed, as squares and dashes.



**Figure 4.** Mean accommodation for age values in the current study compared with previous work.

◆ Donders (1864)      ○ Duane (1912)      △ Sheard (1917)      × Jackson (1922)  
 □ Turner (1958)      ■ Current