

Orthoptics and Orthoptists: The War Years 1939 - 1945

Shayne Brown MAppSc BA DipAppSc FOA

Department of History, University of Sydney, Australia

ABSTRACT

Accurate depth perception was necessary for Royal Australian Air Force (RAAF) pilots during World War II (WWII) to land aircraft safely without the aid of instruments. In the inter-war period aviation ophthalmologists had identified a relationship between heterophorias and inaccurate stereopsis. As a result, the ocular motility standards for trainee aircrew in WWII were strict and failure to meet the standards could result in rejection for flying duties. Orthoptists were called on to test trainees' ocular motility status and, in borderline cases, provide treatment.

By 1939 there were fewer than 20 qualified orthoptists in Australia. This small number was unable to meet the needs of the RAAF while also serving the civilian population. Consequently in 1940 the RAAF Air Board decreed that a small number of RAAF Nursing Service (RAAFNS) and

Women's Auxiliary Australian Air Force (WAAAF) personnel would receive basic orthoptic training to fill the gap. An unknown number of these Service women delivered orthoptic treatment to trainee aircrew, under the supervision of ophthalmologists and orthoptists.

Little is known about the orthoptists' role with the RAAF. Even less is known about the role of the RAAFNSs and WAAAFs. This paper discusses the qualified civilian orthoptists, and their military counterparts, who have come to light so far in my research. I also discuss their work. I argue that the orthoptists' contribution and the place of orthoptics in aviation medicine, in particular the management of heterophorias, was the springboard for the growth of orthoptics in the post-war period.

Keywords: orthoptics, aviation medicine, RAAF, heterophoria, stereopsis

INTRODUCTION

On 13 January 1939 Victoria suffered the worst bushfires in living memory. Seventy-one lives were lost, townships were destroyed and millions of acres of farmland torched in what has come to be known as the Black Friday fires. Perhaps this catastrophic event was a sign of what was to come. Rumbblings about a possible European conflict had been going on for months – war seemed inevitable. When Germany invaded Poland in September 1939 England declared war on Germany. Australia followed suit. Australia's decision to go to war was 'automatic', automatic to a large extent because of our British cultural heritage.

In many fields of endeavour Australia followed England as was the case with orthoptics which had its genesis in England in the mid-1920s. By the outbreak of war orthoptic practice in both countries was similar. Australian orthoptists were skilled in the same testing procedures and treatment techniques as the British orthoptists and

several Australians had travelled to England for their orthoptic training. The Australian training course, albeit in its infancy in 1939, was based on the English model. When war broke out British orthoptists became immediately involved in aviation medicine. They were called on in numbers to assess and treat heterophorias, which had been associated with inaccurate aircraft landings – a particular problem for young trainee aircrew. Australian orthoptists were also involved in aviation medicine, but their roles differed from their British counterparts as did the manner in which orthoptics was delivered.

This is an account of Australian orthoptics during World War II (WWII) and its place in aviation and military medicine. Problems associated with ocular muscle imbalance were not considered as important in the army so will not be dealt with in detail in this paper. However, it is interesting to note that later in the war some army service men began complaining of general ocular symptoms. As a result, ophthalmologist Major Bruce Hamilton conducted a study of 3,285 enlisted men and found that 18.2 percent showed some degree of ocular muscle problems. Because orthoptic services were not available in the army these men were referred to orthoptists in the capital cities, or were treated

Corresponding author: **Shayne Brown**
Email: shayneb1@optusnet.com.au

in the RAAF orthoptic clinics. Hamilton reported that in the majority of cases referred for ocular muscle imbalance, orthoptic treatment was successful.¹

There is a dearth of literature and material pertaining to Australian orthoptic involvement in Australian aviation medical history. Consequently, this largely untold story has been pieced together from a variety of primary sources: scientific ophthalmic and orthoptic papers; newspaper articles; Royal Australian Air Force (RAAF) records. It is acknowledged that what these sources reveal is limited. It is also acknowledged that neither the voices of the qualified orthoptists who worked for the RAAF nor those who continued to work with the civilian population are not heard. The other unheard voices are those in the Royal Australian Air Force Nursing Service (RAAFNS) and the Women's Auxiliary Australian Air Force (WAAAF) who performed the bulk of orthoptic work in the RAAF. This paper concludes with evaluating the role of orthoptics during the war period and contributes to our understanding of the development of the fledgling practice of Australian orthoptics and the influence this period had for the following two to three decades.

What orthoptic historiography reveals

In the mid-1960s orthoptists' role in aviation medicine was mentioned in passing in the orthoptic scientific literature. The very name of the RAF Gauge, hints at its origins. The effect of ocular muscle imbalance on the accuracy of depth perception was known but it was not realised this association had its roots in aviation medicine. It was known that Australian orthoptists had played a role as employed civilians as opposed to service personnel during WWII so when searching for an historical account of their contribution it was surprising that the literature, including the orthoptic literature, is largely silent about this period of Australian orthoptic history.

The original intent of my research was to present a history of the role Australian orthoptists played in WWII. During the research, however, it became clear it was impossible to understand this period without also exploring the role of ophthalmologists and of a small group of RAAF nurses and WAAAF who had received basic orthoptic training specifically to provide orthoptics to the RAAF trainees. Ophthalmologists drove the inclusion of orthoptics as an integral part of selection criteria for RAAF personnel. To me it was a surprise that it was WAAAFs and RAAF nurses, who received some basic orthoptic skills training, not qualified orthoptists, who carried out the bulk of the orthoptic work. After an exhaustive search of Australian and international orthoptic and ophthalmic literature, and general historical databases only four historical accounts of Australian orthoptics during WWII were found. Using the word 'account' may suggest a detailed exposé – not so. Each was a simple narrative stating the most minimal details of orthoptic service and praising its valuable

contribution to aviation medicine.

Immediately post-war Air Vice Marshall Philip Livingston, a Canadian born British ophthalmologist, addressed the annual scientific meeting of the Ophthalmological Society of Australia held in Melbourne.² He outlined a history of the role of ocular muscle imbalance and its influence on trainee pilots' ability to learn to fly in both WWI and WWII. While conceding that rigorous statistical analysis to determine the acceptable limits of ocular muscle imbalance was still required, he strongly held that there was little doubt 'as to the value of orthoptic treatment in the service'.³ The next historical note is a sentence in orthoptist, Patricia Lance's presidential address of 1954, which states 'During the war years, Miss Russell, Mrs D'Ombra and others worked as civilians with the Royal Australian Air Force at Bradfield Park Air Force Station [NSW] under Dr Hazelton'.⁴ This quote provides no historical information except to confirm the names of the two orthoptists in New South Wales (NSW) who performed orthoptic duties. There is no reference to orthoptists in Victoria or in South Australia who had been actively involved, nor of the type of work these women performed. The third historical record is Air Vice Marshall Edward Daley's obituary tribute to Joseph Ringland Anderson. Daley acknowledged Ringland Anderson's efforts to incorporate orthoptic investigation and training to assist 'border-line subjects and those with post-traumatic ocular muscle malfunctioning ... to learn to fly more easily'.⁵ Almost a decade later Daley returned to the same subject when invited to address the 1970 orthoptic graduation in Melbourne. The details in both articles are scant but, apart from information in the RAAF papers, these are the only records of how orthoptics was administered in Australia during the war. While Daley's presentation did not explore the contribution of orthoptists in detail, he affirmed the importance of orthoptics to aviation medicine. He also summarised the contribution of WAAAF personnel, a little known aspect of war time orthoptics.

Empire Air Training Scheme and RAAF Initial Training Schools

Before the outbreak of war, Great Britain realised it could not fill the demand for aircrew and so sought assistance from Australia, Canada, New Zealand and South Africa. The result was the formation of the Empire Air Training Scheme (EATS). The formal agreement to establish the Scheme was signed in Ottawa, Canada in December 1939. By April and May 1940, the first Dominion training schools had opened. In Australia this amounted to 26 training facilities across the country.⁶ Of those training schools, six were Initial Training Schools (ITS) one school each at Somers in Victoria; Sandgate in Queensland; Victor Harbour in South Australia; Clontarf in Western Australia; and two at Bradfield Park in NSW. It was at the Initial Training Schools (ITS) where trainees had their visual

assessment. The number of Australians trained under the EATS was 37,538 and of them 10,882 were pilots.⁶ The body responsible for the oversight of trainee selection was the RAAF's Flying Personnel Research Committee (FPRC).

Why assessment of ocular motor balance was essential for trainee aircrew

Orthoptic examination and treatment of ocular muscle imbalance played an important role in the recruitment and treatment of Royal Air Force (RAF) and RAAF aircrew. From the information available the recruitment tests and orthoptic therapy techniques in Australia and Great Britain were identical. There is also evidence that the testing techniques for ocular muscle imbalance and depth perception were similar in USA.⁷

Before exploring what transpired during the war years, it is important to first examine the scientific knowledge of ocular muscle imbalance and its association with depth perception as it related to aviation. During WWI, Wing Commander and ophthalmologist, Edward Clements investigated a group of pilots who were slow learning to fly. His research was based on work done a decade earlier when he made an association between poor eyesight and motor vehicle accidents.⁸ He found between 75 and 80 percent of accidents by trainee pilots, which resulted in a hospitalisation, were due to poor landings.⁹ The results of his examination showed that 'first-class landers' had better eye muscle balance and more accurate depth perception compared to the 'border line', 'average', 'doubtful' and 'bad landers'.⁹ He opined that borderline cases could benefit from 'eye training'.⁹

In the inter-war period Livingston, who had gained his Wings in the late 1920s, like Clements, became interested in ocular problems associated with flying. In one of Livingston's earliest publications, he directly attributed ocular muscle imbalance with inaccurate depth perception.¹⁰ He found that pilots with esophoria, when attempting to land an aircraft, perceived the ground as being closer than it was, so tended to 'come down heavily on [their] wheels'. While those with an exophoria perceived the ground as further away and would stall the plane. He noted that small errors on approach 'of plus or minus five feet can end in a nasty accident, usually by the propeller catching the ground and turning the aircraft over'.¹⁰ Livingston acknowledged that landing a plane safely was a multi-factorial exercise involving a large range of physiological and psychological attributes and was not solely reliant on a person's depth perception. However, he argued that good ocular muscle balance and accurate stereoscopic vision were essential elements.¹¹ The importance of accurate stereoacuity was also acknowledged by the Germans whose attitude in the late 1930s was 'The value of stereoscopic vision and the ability to judge distances will be confirmed by the pilot and above all by the ground'.¹²

Australia's involvement in aviation ophthalmology benefited from a close relationship between Livingston and Daley who, like Livingston, was both a medical doctor and pilot.¹³ Daley had been sent to England on exchange in 1936 where Livingston and he collaborated. Daley stated 'it was my privilege to be allotted for certain work with him. At the time he was endeavouring to rationalise the range of visual standards required for people learning to fly, and for pilot and aircrew duties generally'.¹⁴ Additionally the FPRC of the RAF had kept Australia abreast of their activities.¹⁵ Consequently with the introduction of the EATS in 1940, the RAF standards were adopted for all Commonwealth aircrew including Australia. Nevertheless, the acceptance of all standards pertaining to ocular muscle treatment was not accepted without debate in Australia.

Required fitness of aircrew

Potential airmen had to be generally fit. Because of the unknown stresses placed on the body by long flying hours and the effects of high altitude and extreme cold, aircrew also had to be 'of sound stock, good personal history, reasonable physique with a stable nervous and vascular system, and physically and mentally alert' which included a high standard of ocular health.¹⁶ The candidates for flying duties were not just pilots but included air observers and gunners, and while their responsibilities differed, the same visual standards, apart from the ocular motility requirements, applied. The necessity for high standards of visual health was especially true in WWII airplanes where there was less reliance on sophisticated instruments compared with the aircraft of today. Hence, it was imperative that aircrew had no significant ocular defects.

Required visual standards for aircrew

Each trainee had to have: good distance and near visual acuity; good night vision; normal colour vision; a full field of vision; normal ocular muscle balance and accurate depth perception.¹⁶ Good distance visual acuity was considered essential to enable accurate take-offs and landings in any conditions and to spot enemy aircraft. The set standard for pilots was visual acuity better than 6/12 in either eye improving to 6/6 with glasses. Observers and gunners were required to have 6/6 in both eyes.¹⁶ While a pilot could wear glasses the permissible degree of optical defect was minimal. The amount of allowable hypermetropia could not exceed 2.25 dioptres and the amount of astigmatism could not exceed 2.5 dioptres.¹⁶ Airmen with even a suggestion of the smallest amount of myopia were rejected, or to use the RAAF term, 'scrubbed'. Near vision had to be good (N5) for reading instrument panels and maps. Good night vision was essential for night-flying missions, so trainees' dark adaptation was tested. Colour vision had to be normal to recognise signals and flares. A pilot's field of vision needed to be full for two reasons – to ensure obstacles could be detected in the periphery of their vision and for successful take-offs and landings. Because landings and take-offs

were often performed without reference to instruments, accurate depth perception was essential. The amount of ocular motor imbalance was measured using the Maddox Rod and fusion was assessed on the synoptophore. For trainee pilots horizontal heterophorias could be no greater than 2-2.5 prism dioptres and vertical heterophorias no greater than 0.75-1.0 prism dioptre. The ocular motility requirements for gunners was not as stringent. A heterophoria was permitted but not a strabismus.¹⁶ The strength of binocular vision was assessed by measuring the fusion range on the synoptophore. The considered normal range was convergence of 40 degrees and five degrees of divergence. Specially designed synoptophore slides (parachutes and fighter planes) were used to assess the degree of stereoscopic vision.

Flying Personnel Research Committee and the Vision Sub-committee of the RAAF

The Australian FPRC was set up late in 1940 on the recommendation of Air Commodore (later Air Vice Marshall) Victor Hurley, Director of the RAAF Medical Services. Its functions were similar to the RAF's FPRC, 'to advise the Air Board on the medical aspects of all matters which might conduce the safety and efficiency in flying and also on research into the scientific selection of personnel and maintenance of their physiological efficiency'.¹⁷ The majority of the research was conducted at the University of Sydney and the University of Melbourne. Subsidiary work was undertaken in Queensland and South Australia.

The FPRC set up a number of advisory sub-committees, one being the Vision Sub-committee. The ophthalmologists on this sub-committee were Flight Lieutenant Walter Counsell, Squadron Leader Joseph Ringland Anderson and Flight Lieutenant Hugh Ryan. They were supported by other ophthalmologists in the RAAF – Squadron Leader Colin Blakemore in NSW; Squadron Leader JLR Carter in Tasmania; Squadron Leader DN Gawler in Western Australia; Squadron Leader EO Marks in Queensland; Squadron Leader Thomas a'Beckett Travers in Victoria; Squadron Leader Alfred Tostevin in South Australia, and the only full-time ophthalmologist, Flight Lieutenant RW Hazelton in NSW.

The Vision Sub-committee was responsible for research into flying goggles (with corrective lenses and anti-glare); cockpit lighting; night vision; visual fatigue and its effect on colour vision, and importantly for this discussion, ocular motility imbalance and binocular vision including the level of depth perception.¹⁸ It was also responsible for the safety and efficiency of aircrew and therefore selection of trainees came under its purview. For the ophthalmology members the accuracy of a person's depth perception was an essential element of the selection process. Even so, from the outset, Hurley was sceptical of the 'supposed' relationship between ocular muscle imbalance and depth perception and the necessary skill to land aircraft. His

submission to the Air Board singled out depth perception as one of the matters which required 'further investigation'.¹⁹ The basis for his scepticism is not known. The fact that he had reservations on the subject is verified by Daley who later recalled the difference of opinion between Ringland Anderson and Hurley regarding the importance of accurate depth perception for landing.⁵

Australian ophthalmology and orthoptic research

Between the first meeting of the FPRC in December 1940 and June 1941 Ringland Anderson, Counsell and orthoptist, Diana Mann, presented information concerning standards set for RAAF personnel at the ophthalmology scientific meeting in 1940. The presentations included the rationale for including orthoptics for ocular muscle imbalance both as a selection test and for treatment for appropriate cases.^{16,20,21} In June 1941 Ringland Anderson and his ophthalmology compatriots on the Vision Sub-committee must have persuaded Hurley to change his stance because his recommendation to the Air Board resulted in the establishment of orthoptic clinics at the ITSS. Whether these clinics were functional by the end of 1941 is unclear, but the FPRC minutes show that a meeting of the Vision Sub-committee was still discussing elements of vision and ocular standards which would suggest that they were not fully operational at all ITSS.

Prior to the meeting on 18 October 1941, Counsell, Ringland Anderson, Tostevin and orthoptist Lucy Willoughby gave papers at the ophthalmology scientific meeting in Melbourne. Counsell's paper presented an in-depth examination of British and American research into the diagnosis of ocular muscle imbalance and the effectiveness of orthoptic treatment.¹⁶ Ringland Anderson's findings with Australian aircrew mirrored the overseas experience concluding that ocular muscle imbalance 'can be remedied by orthoptic training and that great improvement in flying ability follows'.¹² Tostevin and Willoughby reported on research they had conducted on RAAF trainees in South Australia.^{22,23} They showed that ocular defects, as the principal cause of pilot failure, were negligible, and that landing faults were due to a myriad of causes. While their findings seemed to be at odds with those of Ringland Anderson and Counsell, they conceded that their sample was small and advocated continuing research. In sum, the debate centred on what tests should be administered as a screening tool, and what cases would benefit from orthoptic exercises, rather than any clinical objection to the assessment of ocular muscle balance per se.

Who assessed RAAF trainees' ocular motility?

I had always thought that qualified orthoptists examined all the RAAF personnel but this was not always the case. The Australian model of orthoptic service delivery was based on the English experience, but there were significant differences. Interestingly, Livingston reported the original

intention in England was for the orthoptic work, within the RAF, to be carried out by ophthalmic surgeons, but when the work load became too great 'a number of orthoptists were brought into service'.²⁴ Unlike Australia, orthoptics in England was immediately impacted by the outbreak of war. Hospitals were made ready for casualties and orthoptic clinics closed leaving many London-based orthoptists without work. When Livingston required orthoptists to work with RAF personnel, a number of them were employed as civilian staff. However, as their numbers rose to around 30, the authorities decreed they should be incorporated into the Service. Most entered the Women's Auxiliary Air Force (WAAF) as Non-Commissioned Officers (NCOs).²⁵

Australia's experience was different. Before the bombing of Darwin on 19 February 1942, the Australian mainland had not been threatened by enemy attack so no hospitals and no orthoptic clinics had been closed. To a certain extent civilian life went on as usual and it is most likely that orthoptists continued their clinical work as before the outbreak of war. However, the major difference was that Australia had a much smaller orthoptic workforce compared to Britain. In Britain most orthoptists were employed in the public hospitals with many occupying full-time positions. In Australia the profession was less than a decade old. There were no full-time positions. Orthoptists worked part-time in eye clinics in public hospitals and part-time in private orthoptic practices to make up a full-time week of work. When war broke out there were fewer than 20 qualified Australian orthoptists. Several were working in Melbourne, several in Sydney, one in Adelaide, and one in Hobart. In the FPRC minutes there is mention of an orthoptist working in Brisbane but there are no orthoptic records to identify her. The FPRC minutes omit to say that there was an orthoptist in Adelaide, so it is possible that the minutes are incorrect and should have recorded that there was one orthoptist in Adelaide, rather than one orthoptist in Brisbane.

Australian orthoptists and their roles

During the war period an unknown number of civilian qualified orthoptists worked with ophthalmologists for the RAAF. Those known were: Janet (Bowman) Arnold; Ethel D'Ombrian and Emmie Russell in Sydney; Bev Balfour and Diana Mann (later Craig) in Victoria and Lucy Willoughby (later Retalic) in Adelaide. Other orthoptists may have been involved but no records exist to indicate who they were. There is no evidence that Lena Gilchrist in Hobart worked with the RAAF but she assisted Counsell in gathering data from a series of her private patients. Russell, Mann and Willoughby were also involved in research. Willoughby had been invited and presented a paper at the 1940 ophthalmological scientific meeting. As mentioned earlier she collaborated with Tostevin when the criteria for selection of orthoptic tests as a screening tool were being debated.²³

The FPCM Minutes of 18 October 1941 document that there was no orthoptist available in Victoria. That may have been true at the time, but later Mann played a significant role in RAAF training and in research. Towards the end of the war she and Russell were invited to comment on the criteria for the research project set up to measure the effectiveness of orthoptic treatment.²⁶ This situation changed following the special conference of the Vision Sub-committee held on 18 October 1941 to discuss and formalise the role of orthoptics in the RAAF and how orthoptic services would be delivered, including the role of civilian orthoptists. The attendees at that conference were service ophthalmologists and all available ITS medical officers. Daley, who was the Acting Director of Medical Services, presided over the meeting. He stated at the outset that 'In forming our medical standards for the Royal Australian Air Force we must always be guided by those as adopted by the Royal Air Force. This is now all the more necessary since under the EAT Scheme Australia and the Royal Air Force serve side by side and any Commander of a mixed squadron must know that his personnel are physically capable of performing the same tasks'.²⁷

Despite Daley's directive that RAF standards must be adopted there was concern that the RAF had lowered the criterion for visual acuity from 6/12 to 6/18 and had increased the size of allowable heterophorias by a couple of degrees. However, as Australia had 7,000 men on the wait-list to be tested they considered there were enough applicants with good visual acuity not to have to reduce the standard to 6/18. The sub-committee was also 'not prepared to take on those with muscle balance measurements outside the standards as they had sufficient recruits whose eye muscle balance was within the required limits. Time could be wasted training these young men when they could be gunners or observers'.²⁸ Ringland Anderson thought it more important to give orthoptic treatment to those who would fly solo, or to those whose visual judgement could be improved, rather than accept applicants with heterophorias outside the set limits. Lengthy debate ensued as to who should receive orthoptic training and how the effectiveness should be assessed. Against Ringland Anderson's wishes, there was a majority agreement to assess the outcomes of orthoptic therapy. He was not against measuring the appropriateness per se, but he was so convinced that orthoptic therapy aided pilots' ability to land their aircraft safely that he thought a research project would take up valuable time and would put trainees at risk of accidents. As events transpired efforts were made to carry out the assessment in 1944 but the war ended before sufficient data had been accumulated.

WAAAF and RAAFNS roles

Qualified orthoptists were not the only group to deliver orthoptic services to the RAAF. As discussed at the Vision Sub-committee it was recognised that the orthoptic

manpower could not meet the demand for orthoptic services for the RAAF. Additionally, the Air Board did not want civilians and preferred that the positions be full and not part-time.²⁹ The solution was to train others. Daley announced that the Air Board had made the decision that orthoptic clinics at the ITS be staffed by a medical officer who had received eye training, and answering to him would be one or two RAAF nursing sisters and WAAAF personnel who would carry out orthoptic work. Clerks would be supplied for record keeping to save the orthoptists' time.

Daley stressed the importance of having a uniform scheme across all the ITSs.³⁰ He noted that Ringland Anderson had already commenced orthoptic training for six WAAAF personnel. Ringland Anderson had set up the first orthoptic training school in Australia in the early 1930s and so was eminently qualified to conduct the proposed training. Whether the qualified orthoptists were concerned that some people would gain partial orthoptics skills is not known. However, it was recognised that a lay workforce could not replace the adequately trained and professional orthoptists. As a consequence, one qualified orthoptist in each state was employed by the RAAF. It was further agreed that the services of the professional orthoptists who were 'currently engaged should be retained indefinitely irrespective of the capacity in which they were serving'.³⁰ These comments suggest that the level of training Ringland Anderson provided was below that required for a fully qualified orthoptist. Therefore, it is possible that the WAAAF lay workers were skilled in a limited number of orthoptic procedures but not skilled enough to be considered a qualified orthoptist. Daley provides some evidence for this when he said 'we established of necessity a special Visual Centre, with [a] Medical Officer, [a] Sister and [a] WAAAF medical orderly, each empirically trained to some degree in eye examination, in the use of orthoptic methods (my emphasis)'.⁵ From available sources at least six WAAAFs trained under Ringland Anderson's scheme. Records suggest that only one WAAAF went on to complete formal training. She was Sergeant Beatrice Lilian Barnes who had joined the WAAAF in 1942 as a sick-quarter attendant, having previously studied pharmacy.³¹ When Barnes gained her qualifications in 1945 she was the first servicewoman in Australia to obtain the Diploma of Orthoptics.³² She continued orthoptic practice for some years after the war.

Apart from Barnes no records can be found of any WAAAFs or members of the RAAFNS personnel, who carried out orthoptic tasks during the war, who then continued to practise, or attempted to practise orthoptics in peace time. There is evidence that Sister Eve Ahlston, a member of the RAAFNS who trained as a nursing sister at the Prince Alfred Hospital pre-war, undertook some orthoptic duties at a number of ITSs. Her specific tasks are not recorded but in July 1945 she was involved in a proposed research project

'to test the test-retest reliability of some of the Orthoptic Tests' which would suggest a degree of proficiency.³³ After the war she worked at the Medical Eye Service (MES) in Melbourne. It is possible that she worked there in an administrative capacity rather than performing orthoptic duties as evidenced by a letter she sent to the editor of the Age newspaper and signed by her as the Secretary of MES. What became of the WAAAFs who trained with Ringland Anderson in 1941 or any member of the RAAFNS, other than Eve Ahlston, is a mystery. It is possible that they fulfilled their duty working at ITSs during the war, but did not pursue a career in orthoptics in peace time.

The role of other personnel

There is also evidence that other non-qualified personnel were involved in orthoptics within the RAAF. In 1942, Mrs John Baker (nee Mary McGlif) delivered a talk on orthoptic work in the RAAF to an alumna gathering of the Presbyterian Girls' College in Adelaide (now Seymour College). The newspaper article states that she was amongst 'women and girls in uniform [who] will talk about their war work'.³⁴ Her exact role with the RAAF is uncertain. Could she have been one of those trained by orthoptist Lucy Willoughby at the ITS at Parafield in South Australia? Barker's name does not appear on the orthoptic register so it would appear that she did not have formal orthoptic training. Additionally, she was married and it was most unlikely that a newly married woman at that time would have embarked on a new career. It is more likely that Barker's and Willoughby's paths may have crossed socially. Both had been kindergarten teachers, although Barker would have completed her training by the time Willoughby changed careers and was a qualified orthoptist. They both worked on the same charity functions and Barker was a member of the Red Cross. Her daughters have been able to provide some, although sketchy, information and confirmed that their mother 'tested pilot's vision'.³⁵ Whether she did more ocular examinations than test vision is unknown. They also commented that their mother had not been allowed to work once she was married and so did volunteer work with the Red Cross.³⁵

CONCLUSION

On reflection the war period was an important time in the history of Australian orthoptics. Women gained a voice in the profession and drove its development both scientifically and through the establishment of the professional association. The Orthoptic Association of Australia, now Orthoptics Australia, was formed in 1944 following preliminary discussions in 1942. Those orthoptists who worked for the RAAF in wartime - Janet Arnold, Bev Balfour, Ethel D'Ombra, Diana Mann, Emmie Russell and Lucy Willoughby, were founding members of the association. All

played active roles in setting up and running the association in its formation period and for the ensuing decades. Annual scientific meetings were held and transactions from the meetings were published in the precursor to the Australian Orthoptic Journal. Over the following years the training courses in NSW and Victoria were formalised and the registration boards, the Orthoptic Association of Australia and the Orthoptic Councils of NSW and Victoria, became more firmly established.

Management of heterophorias was an ongoing topic of orthoptic research. As late as the 1980s many orthoptists would state that heterophorias made up the bulk of their clinical practices, particularly in private practice. It was probably not appreciated in the post-war period, but in hindsight the work of the wartime orthoptists with the RAAF personnel profoundly influenced the practice of orthoptics for years to come.

ACKNOWLEDGEMENTS

My grateful thanks go to Peter Hobbins and Judith Godden of the University of Sydney who are supervisors for my Master's research and who provide continuing support and encouragement. Without Peter's guidance I would not have uncovered the RAAF records which are crucial to the understanding of how orthoptics was delivered during WWII. My thanks, too, to orthoptists Lyn Brent, Rosemary Farrow, Marion Rivers and Jill Taylor who supplied information I would otherwise not have found, and to RAAF Archivists Roz Turner and Monica Walsh who scoured the RAAF archives to confirm that, to our knowledge, no WAAAF or RAAFNS personnel went on to practise orthoptics post-war.

REFERENCES

- Walker AS. Australia in the war of 1939-1945. Series Five Medical. Vol. 1. Clinical Problems of War. Canberra: Australian War Memorial; 1952.
- Excellence in combat: Doctor praises Australians. *The Age* (Melbourne, Vic:1854-1954), Wednesday 23 October 1946:2. [cited 2016 17th Sep] Available from: <http://trove.nla.gov.au/newspaper/article/204949849>.
- Livingston PC. Heterophoria in aircrew: its clinical and psychological significance. *Trans Ophthalmol Soc (Br Med Assoc)* 1946;6:60-75.
- Lance P. Presidential address: a history of the treatment of strabismus. Minutes of the Eleventh Annual Scientific Meeting of the Orthoptic Association of Australia; Melbourne: Orthoptics Australia; 1954:1-19.
- Daley E. Joseph Ringland Anderson. *Aust J Ophthalmol* 1961;21:7-8.
- Ilbery P. *Empire Airmen Strike Back: the Empire Air Training Scheme and 5SFTS, Uranquinty*. Maryborough: Banner Books; 1999.
- Armstrong HG. *Principles and Practice of Aviation Medicine*. Baltimore: The Williams and Wilkins Company; 1943.
- Clements EC. Errors of vision as a factor in motor car accidents. *Br Med J* 1906;2(2397):1636.
- Clements EC. Visual Problems in regard to flying and industrial fatigue from a service standpoint. *Proc R Soc Med* 1925;19:15-23.
- Livingston PC. The role of heterophoria in binocular disharmony with special reference to air pilotage. *Br Med J* 1937; 2(3999):409-411.
- Livingston PC. Approach to the phorias. *Br Orthopt J* 1939;171-104.
- Ringland Anderson J. Aviation and orthoptics. *Trans Ophthalmol Soc Aust (Br Med Assoc)* 1941;3:151-159.
- Thomson DS. Daley Edward Alfred (Ted) (1901-1985). *Australian Dictionary of Biography*, Australian National University 2007;17:1-2.
- Daley E. Orthoptists and the Royal Australian Air Force. *Aust Orthopt J* 1970-1971;11:8-10.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 132/1/956,1941:268.
- Counsell WD. Air Force eye standards and examination procedure. *Trans Ophthalmol Soc (Br Med Assoc)* 1940;2:7-18.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 132/1/573 Part 1,1940:40.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 43/1/527 Part 1, 1941-1943:379.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 132/1/573 Part 1, 1943-194:41.
- Ringland Anderson J. Some aspects of visual fusion in peace and war. *Trans Ophthalmol Soc (Br Med Assoc)* 1940;2:20-25.
- Mann D. Treatment of fusion (convergence) deficiency. *Trans Ophthalmol Soc (Br Med Assoc)* 1940;2:26-27.
- Tostevin AL. Orthoptics and aviation. *Trans Ophthalmol Soc (Br Med Assoc)* 1941;3:145-146.
- Willoughby L. Research into the effects of ocular conditions in pilot training. *Trans Ophthalmol Soc (Br Med Assoc)* 1941;3:147-150.
- Livingston PC. The present position of orthoptics in aviation ophthalmology. National Archives of Australia Appendix A. Flying Personnel Research Committee Minutes, National Archives of Australia A705, Control 132/1/956 18 Oct 1941:280-283.
- MacLellan AV. *Orthoptics, The Early Years: Recollections and a Personal Account*. Keighley, Yorkshire: Ann Macvie; 2006.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 132/1/956, 1941:225 and 168.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 132/1/956, 1941:268.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 132/132/1/956, 1941:259.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 132/1/956, 1941:267.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, Series A705, Control 132/1/956, 1941:259.
- How Sydney celebrated. *The Dubbo Liberal and Macquarie Advocate* (NSW: 1894-1954) Thursday 23 August 1945:4. [cited 2016 7th Nov] Available from: <http://trove.nla.gov.au/newspaper/article/133035030>.
- Interesting people. *The Australian Women's Weekly*. Saturday 1 September 1945:10. [cited 2016 10th Oct] Available from: <http://trove.nla.gov.au/newspaper/article/47246836>.
- [Medical – General] – Flying Personnel Research Committee, Canberra: National Archives of Australia, FPRC Minutes A705, Control 132/1/956 1941; 18 October:280-283.
- Women talk on war work tonight. *News* (Adelaide, SA: 1923-1954) 1 June 1942:5. [cited 2016 7th Sep] Available from: <http://trove.nla.gov.au/newspaper/article/128551100>.
- Email communication from Louise (Barker) Lipman with Shayne Brown 16th December 2016.