

Suttle, C. M., Challinor, K. L., Thompson, R. E., Pesudovs, K., Togher, L., Chiavaroli, N., Lee, A., Junghans, B., Stapleton, F., Watt, K. & Jalbert, I. (2015). Attitudes and barriers to evidence-based practice in optometry educators. *Optometry and Vision Science*, 92(4), pp. 514-523. doi: 10.1097/OPX.0000000000000550



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**Original citation:** Suttle, C. M., Challinor, K. L., Thompson, R. E., Pesudovs, K., Togher, L., Chiavaroli, N., Lee, A., Junghans, B., Stapleton, F., Watt, K. & Jalbert, I. (2015). Attitudes and barriers to evidence-based practice in optometry educators. *Optometry and Vision Science*, 92(4), pp. 514-523. doi: 10.1097/OPX.0000000000000550

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1 Attitudes and Perceived Barriers to Evidence-Based Practice in Optometry Educators

2

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15 Date submitted: 14 July 2014

16 Number of tables: 2; Number of figures: 4

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22

23 **Purpose:** Evidence-based practice (EBP) is an essential component of good quality, patient-centred  
24 health care. This requires practitioners to acquire EBP skills and knowledge during undergraduate and  
25 continuing education. EBP education exists in a range of health care disciplines, including optometry.  
26 EBP education, however, depends on relevant skills and knowledge in educators. Courses and  
27 workshops exist for the development of EBP teaching skills in some areas of health care, but not in  
28 optometry. Here we describe a pilot workshop designed to enhance the teaching of EBP and to  
29 investigate the perspectives of optometric educators on EBP including their attitudes and perceived  
30 barriers to EBP and its teaching. **Methods:** Twenty-seven optometric educators including 8 facilitators  
31 participated. Of these, 14 were academics (including the 8 facilitators) and 13 were practitioners. EBP  
32 attitudes were assessed using the Evidence-Based Practice Attitude Scale (EBPAS)-50 with appropriate  
33 modifications for optometry. Workshop design incorporated strategies to trigger discussion among  
34 participants. A nominal group technique was used to identify, prioritize and reach consensus on barriers  
35 to EBP. **Results:** Whilst some participants expressed reservations about EBP, a common understanding  
36 of the contemporary definition of EBP emerged in educators. Thirty-five barriers to EBP were identified;  
37 'time' was selected in the top 5 barriers by most participants and attracted the highest total score, well  
38 above any other barrier (negative attitude to EBP, volume of evidence, integration with clinical practice  
39 and lack of lifelong learning mindset). Attitudes toward EBP were generally positive and negatively  
40 correlated with age and time since graduation, respectively. **Conclusions:** A group of optometrists and  
41 academics new to implementing education in EBP displayed positive attitudes to EBP but considered  
42 that its application and teaching could be significantly hindered by a lack of time to access and appraise  
43 the large volume of available research evidence in the field of eye care.

44 **Key words:** Evidence-based practice, optometric education

45

46 **Introduction**

47 Evidence-based practice (EBP) involves clinical decision-making that is based on the current best  
48 evidence in consultation with the patient and informed by the expertise of the practitioner.<sup>1-3</sup> The 'best'  
49 evidence is the most reliable and valid and can be obtained from sources ranging from critical  
50 summaries, evidence-based synopses and systematic reviews of high level, high quality research such as  
51 randomized controlled trials, to less reliable research such as individual case reports and expert  
52 opinions.<sup>4</sup> The process of EBP involves the five steps of: asking answerable questions, searching for  
53 evidence, critically appraising evidence, making decisions, and evaluating outcomes.<sup>2, 3, 5</sup> This process is  
54 sometimes referred to as the 5 A's for 'Ask', 'Acquire', 'Appraise', 'Apply' and 'Audit'.

55

56 EBP is increasingly recognized in allied health disciplines including optometry.<sup>2, 3, 6-15</sup> However,  
57 recognition of the need for EBP is only one step toward it becoming a reality for a profession; this  
58 cannot occur unless practitioners are properly trained and know how to practice in this way. EBP  
59 requires a set of skills and knowledge including the ability to find and appraise evidence and to apply the  
60 best evidence at the point of clinical decision-making.<sup>2, 5</sup> These attributes must be taught in  
61 undergraduate and continuing optometry education, acquired by students and practitioners and  
62 hopefully maintained throughout practice life. Recent work on the design of undergraduate and  
63 continuing optometric education has resulted in EBP being a core part of many optometry curricula. For  
64 example, a survey of North American optometry and ophthalmology educators provided  
65 recommendations for enhanced EBP learning and teaching in these disciplines.<sup>16</sup> In Australia and New  
66 Zealand, schools and departments of optometry collaborated on a project that aimed to ensure that all  
67 optometry students in that region graduate with the skills and knowledge needed for EBP.<sup>17</sup> This in turn  
68 requires teachers and educators who are equipped for this task.

69

70 EBP skills and knowledge may not, however, be enough to ensure EBP practice.<sup>18</sup> EBP may not be  
71 adopted by educators, students and practitioners unless they understand the need for and significance  
72 of this approach and hold a positive attitude to EBP. Thus, evidence-based optometry depends in part  
73 on education and training including the EBP skills, knowledge and attitude of the educators themselves,  
74 and their ability to teach EBP. In medicine and some allied health disciplines, the importance of high  
75 quality EBP teaching has been widely recognized and workshops and courses have been developed and  
76 implemented to ensure that teachers have the skills and attributes required to teach EBP. McMaster  
77 University has offered a two-day course in evidence-based medicine (EBM) that has evolved over the  
78 past 20 years and includes interactive sessions, role playing and mentoring.<sup>19</sup> A different format has  
79 been employed by the EBM Unity project team whose course is available online for teachers of EBM.<sup>20</sup>  
80 The course was designed to allow practitioner-teachers to undertake sessions at their convenience, such  
81 as during breaks in clinical work, and to encourage teachers to use clinical situations to teach EBM.<sup>20</sup> The  
82 Critical Appraisal Skills Program (CASP) provides workshops that aim to develop skills in critical appraisal  
83 and in teaching EBP for any health care discipline.<sup>21</sup> In allied health, a two-day train-the-trainers  
84 workshop has been devised for podiatry educators, with face-to-face delivery of lectures and discussions  
85 as well as exercises relevant to EBP. The workshop was found to improve self-reporting of EBP skills,  
86 though some changes in practitioner-teacher behavior were not maintained in the longer term due to a  
87 range of factors including a lack of necessary resources.<sup>22</sup>

88

89 Australian and New Zealand optometrists recently reported that their clinical decision-making is based  
90 more heavily on sources of knowledge and information such as undergraduate and continuing education  
91 than on evidence they have sourced and appraised themselves, such as from scientific journals that may

92 include recent, peer-reviewed research.<sup>10</sup> Similarly, recent findings from a UK study indicate that  
93 optometrists rely largely on non peer-reviewed professional journals for evidence to support advice for  
94 patients with age-related macular degeneration.<sup>23</sup> Taken together, these findings suggest that  
95 optometrists may not always look for the best available evidence via the EBP process of search and  
96 appraisal. This may reflect a lack of EBP skills and knowledge, and/or a failure to appreciate the need for  
97 an evidence-based approach to clinical decision-making, as well as other factors such as lack of time or  
98 access to evidence. These barriers are commonly reported in other health fields including medicine.<sup>24-27</sup>

99

100 Discussion on the outlooks and approaches of academics and health care practitioners points to  
101 differences in their communities and cultures and suggests a divide between the two.<sup>28</sup> However, these  
102 diverse perspectives and experiences are acknowledged as important components in the teaching of  
103 EBP for health care.<sup>9</sup> The EBP skills, knowledge and attitudes of the academics and practitioners  
104 responsible for teaching optometrists have not been explored to date. There are also no published  
105 reports of training in EBP for educators in optometry. Without such training, it is feasible that  
106 optometric teachers, who themselves have not necessarily received education in EBP, do not have the  
107 skills and knowledge needed for EBP, nor an understanding of the need for EBP in clinical decision-  
108 making, and may not have experience or expertise in teaching EBP. The work described here is part of a  
109 larger collaborative project involving optometry schools and departments in Australasia.<sup>17</sup> In the part of  
110 the project described here, our goal was to design and deliver a pilot workshop to enhance the teaching  
111 of EBP in an undergraduate optometry curriculum. As part of the workshop, we investigated the  
112 perspectives of optometric educators on EBP including their attitudes and any barriers to EBP perceived  
113 by them. The workshop intended to focus on both the practice and the teaching of EBP, with a primary  
114 focus on teaching because it was created for and attended by optometric educators.

115

116 **Methods**

117 A one-day workshop was designed based in part on the published description of existing face-to-face  
118 workshops for teachers of EBP<sup>19</sup> and by drawing on the experience of authors AL and NC in medical  
119 education. The workshop design took into account the fact that participants would be experienced in  
120 teaching within either a classroom or clinical setting but that their EBP knowledge, skills and attitude  
121 were unknown and may vary. We used a blend of didactic and non-didactic methods such as lectures,  
122 small-group discussions, facilitated and interactive sessions and panel discussions. This was intended to  
123 enhance learning and to allow the participants to actively discuss the issues presented, to reach their  
124 own conclusions on any discussion topics,<sup>29</sup> and broadly follows the format of the McMaster EBP  
125 workshops.<sup>19</sup> Twenty-four of 27 participants including the facilitators signed an appearance release  
126 agreeing for audio, video and statements recorded during the day to be used for educational,  
127 promotional and editorial purposes. While ethical approval was not required for the overall workshop as  
128 this was deemed curriculum improvement, it was obtained for one part of the workshop in which the  
129 educators' attitudes to EBP prior to and following completion of the workshop were sampled.

130

131 EBP experts from outside of optometry (authors RT and LT; medicine and speech pathology respectively)  
132 and within optometry were invited to co-facilitate the workshop alongside an education expert with  
133 experience of teaching medicine from an EBP perspective (author AL). Each facilitator brought extensive  
134 experience of teaching EBP in their field. All academic teachers in the host institution's optometry  
135 program (UNSW Australia) who were not facilitators received an invitation to attend. Clinical teachers  
136 were selected for invitation from a larger pool of external visiting clinicians regularly delivering  
137 optometric education at the UNSW Optometry Clinic. Six of 12 invited (non-facilitator) academics and 13



138 of 18 invited clinical teachers participated in the workshop. Selection was guided by the Optometry  
139 School's clinic director (author KW), and in line with maximum variation sampling strategies was  
140 intended to ensure that the workshop attendees included a mix of optometric educators with different  
141 levels of perceived familiarity and interest in EBP and education. Of the 27 optometric educators who  
142 participated in the workshop, 14 were academics (including the 8 facilitators) and 13 were clinical  
143 supervisors.

144  
145 Optometric educators were divided into small groups of four to five non-facilitator participants for  
146 discussions at the workshop. Each small group included approximately equal numbers of academic and  
147 clinical teachers with the intention of including different perspectives in each group.<sup>19</sup> Eight facilitators  
148 including five optometrists attended the workshop and were seated separately from other groups, so  
149 that all facilitators participated in all sessions and made contributions to discussions throughout the  
150 workshop, but did not contribute directly to small-group discussion among optometric educators. In line  
151 with the McMaster recommendations, the workshop adopted the characteristics of small group  
152 interactive sessions, high educator to learner ratio, heterogeneity of learners and feedback.<sup>19</sup> The  
153 content of the workshop is summarized in Table 1 and, as outlined above, included a mix of activities  
154 such as didactic presentations, interactive discussions and self-directed exploration.

155  
156 EBP attitudes can be measured qualitatively<sup>30</sup> or using one of a few existing tools.<sup>31-33</sup> Attitudes toward  
157 EBP were assessed before and after the workshop using a modified version of the Evidence-Based  
158 Practice Attitude Scale (EBPAS – 50<sup>31</sup>), which has previously been validated for use by mental health  
159 practitioners<sup>31</sup> and physicians<sup>34</sup> (see Table, Supplemental Digital Content 1, which contains the Evidence-  
160 Based Practice Attitude Scale (EBPAS) for optometry). The modifications involved changes to wording so

161 that terminology was relevant for optometrists. These modifications included, for example, replacing  
162 the word *clients* with *patients*. Modifications were proposed and reviewed using an iterative process  
163 and feedback from a panel of 12 EBP experts (including 8 optometrists). The modified EBPAS is a 50-item  
164 questionnaire that samples optometrists' attitudes towards EBP across 12 sub-scales or domains (see  
165 Table, Supplemental Digital Content 1, which contains the Evidence-Based Practice Attitude Scale  
166 (EBPAS) for optometry).

167

168 A score for each domain is obtained by averaging the responses to individual sub-scale items scored on a  
169 five-step 0 to 4 categorical scale where 0 = "not at all" and 4 = "to a very great extent" with a value of 4  
170 representing a positive attitude and a value of 0 a negative attitude. The domains of divergence,  
171 limitations, monitoring, and burden were reversed to calculate the composite score EBPAS-50. All  
172 domains were combined to form the EBPAS-50 score.

173

174 The workshop included a number of small group (four to five participants in each) discussions, one of  
175 which opened the workshop with discussion on perceptions and attitudes to EBP. Participants were  
176 asked the questions: "*What does evidence-based practice mean to you, and what is its significance to*  
177 *optometry?*" (Table 1, Session 1). In a second discussion, participants were asked the question: "*What*  
178 *strategies do you use to teach optometry students to be evidence-based practitioners?*" (Table 1, Session  
179 5). Responses were collected and the strategies discussed with the whole group including facilitators.  
180 The aim of this session was to provoke thought and generate discussion on teaching strategies that  
181 could potentially be used to teach EBP in optometry, with input from facilitators with related  
182 experience.

183

184 The workshop included a lecture on the internationally accepted expert consensus view of EBP including  
185 its definition, the EBP process and its significance to health care (Table 1, Session 2).<sup>2</sup> The rationale for  
186 including this lecture was to ensure that, once individuals' thoughts on the meaning of EBP had been  
187 gathered, all were made aware of the widely accepted meaning and significance of EBP. The Sicily  
188 statements<sup>1,8</sup> were outlined in this lecture, focusing not only on the Sicily group's definition of the  
189 meaning and significance of EBP but also on its emphasis on the importance of effective teaching of EBP.  
190 Two additional lectures were delivered during the workshop describing experiences of teaching EBP in  
191 medicine (author RT) and teaching EBP in ophthalmology and optometry (author KP) (Table 1, Sessions 3  
192 and 4). These lectures were intended to illustrate teaching approaches and methods that have been  
193 used to develop skills and knowledge needed for EBP in these areas, and to outline the nature and  
194 resolution of any difficulties encountered in teaching EBP.

195

196 During the workshop, a structured qualitative interactive session was conducted<sup>35</sup> with the aim of  
197 identifying barriers to EBP in optometry (Table 1, Session 6), as a basis for a discussion on overcoming  
198 such barriers. An approach combining the nominal group technique<sup>35</sup> with a fishbowl technique<sup>36</sup> was  
199 used to elicit, prioritize and semi-quantify barriers to EBP. A highly experienced health education expert  
200 facilitated this session (author AL).<sup>37</sup> The nominal group technique is a qualitative method of data  
201 collection that enables a group to generate and prioritize a large number of issues with a structure that  
202 gives everyone an equal voice. It has been used in a number of health contexts to generate ideas and  
203 allow a group to reach consensus on barriers and facilitators to health practices.<sup>38, 39</sup> The 25 participants  
204 at this session were given an individual card and asked to record silently their responses to the question  
205 *"What are the main difficulties and challenges you face in teaching & applying EBP?"* The participants

206 included the 19 non-facilitators, four optometrist facilitators and two non-optometrist facilitators  
207 (authors LT and RT). Thus, the responses include a small contribution from a non-optometry perspective.  
208 Eight non-facilitator attendees were pseudo-randomly selected (the first to return to the room after a  
209 break) to form the “fishbowl” with the remaining 17 participants forming an outer group seated behind  
210 them. Participants in the fishbowl took turns to read aloud a single response from their card with each  
211 response recorded on a flip chart. This continued in a round robin fashion until all responses from the  
212 fishbowl were exhausted. Omissions were identified by asking participants in the outer group to  
213 contribute any responses from their cards that had not already been nominated. A facilitated discussion  
214 followed in which responses were reviewed and clarified. Group consensus was reached on the meaning  
215 of each individual contribution and similar items were amalgamated, to ensure that all responses were  
216 accurately represented. Participants were then asked to individually choose, rank and record five  
217 responses they personally considered most important with the most important granted a score of five  
218 and the least important a score of one. The rankings were summed for each barrier and displayed on the  
219 flip chart for the group to see. The barriers were subsequently reviewed (post workshop) by two authors  
220 (IJ, CS) who identified themes individually and reviewed their findings collaboratively to reach  
221 consensus. For each barrier, the number of votes it received (maximum 25) and its total (maximum  
222 possible score of 125 if top rank of 5 was given by all 25 participants) and average score (total score  
223 divided by the number of votes) were recorded (see Table, Supplemental Digital Content 2, which lists  
224 the identified barriers to EBP in optometry and their associated scores).

225

226 Once barriers had been identified, a moderated panel discussion featuring four EBP educators with  
227 backgrounds in optometry (authors KP, FS), medicine (author RT) and speech pathology (author LT)  
228 allowed participants to raise questions and to discuss points that may have arisen following the lectures

229 and interactive sessions held prior. Discussions focused largely on possible solutions to the top five  
230 barriers identified in the previous session of the workshop. Feedback on the workshop was gathered by  
231 inviting the 19 non-facilitator participants to complete a short semi-structured evaluation questionnaire  
232 at the conclusion of the workshop.

233

234 Data analysis involved a combination of quantitative and qualitative methods as described above.

235 Qualitative data analysis was carried out using a grounded theory approach by identifying themes.

236 Statistical analysis was carried out using SPSS for Windows Version 22 (SPSS for Windows, Chicago, IL).

237 Non-parametric statistics were used for analyzing the EBPAS score because of the categorical nature of

238 the data. Associations were tested using Spearman's rho correlation. Statistical significance was set at

239 5%.

240

## 241 **Results**

242 The demographic characteristics of 18 of the 19 non-facilitator workshop participants who completed

243 the EBPAS and of the 25 participants in the nominal group sessions are shown in Table 2. Participants'

244 attitudes toward EBP were generally positive with a mean EBPAS-50 score of  $2.7 \pm 0.3$  (range 2.3 to 3.1)

245 out of a possible four. Figure 1 displays the boxplots of responses from the 18 participants across the

246 twelve EBPAS domains. No difference was found between EBPAS-50 scores in the six non-facilitator

247 participants who categorized themselves as 'academic' and the 12 who categorized themselves as

248 'clinical supervisor/practitioner' (Mann-Whitney test,  $p=0.3$ ). A negative correlation was found between

249 attitudes to EBP measured by the EBPAS-50 score and age (Spearman's rho=-0.57,  $p=0.01$ ) (Figure 2A)

250 and time since graduation (Spearman's rho=-0.57,  $p=0.01$ ) (Figure 2B). Gender, education and self-

251 perceived EBP expertise level had no effect on attitudes to EBP (group t-test or one-way ANOVA;  
252  $p>0.05$ ).

253

254 Non-facilitator participants' responses to the questions "*What does evidence-based practice mean to*  
255 *you, and what is its significance in optometry?*" and "*What strategies do you use to teach optometry*  
256 *students how to be evidence-based practitioners?*" are summarized in Table 3. All groups of optometric  
257 educators indicated that EBP means the application of the best available research to clinical decision-  
258 making, while approximately half the groups indicated that it means the patient is informed as part of  
259 the decision making process. Although this qualitative data cannot be analyzed quantitatively, this  
260 demonstrates that at least one educator in each of these groups understood that high quality / level  
261 research is integral to EBP and that EBP involves the patient in clinical decision making. Educators made  
262 a range of other positive points about EBP. Some participants expressed reservations about EBP, namely  
263 that it could mean a delay in treatment while awaiting evidence and may stifle creativity.

264

265 The nominal group process identified 35 distinct barriers to practicing or teaching EBP and these were  
266 segregated into the following four themes: time, knowledge / curriculum, attitude and access (see  
267 Table, Supplemental Digital Content 2, which lists the identified barriers to EBP in optometry and their  
268 associated scores). Fourteen of the 35 barriers pertained specifically to EBP teaching and not to EBP  
269 practice. The remaining 21 barriers could apply to both EBP practice and EBP teaching. The average  
270 score for each barrier varied from 0.0 to 4.4. Figure 3 illustrates the most frequently cited barriers  
271 including the five that attracted the highest total scores. These represent the greatest perceived  
272 impediments to EBP teaching and/or practice for our sample of optometry educators. While a number  
273 of barriers to teaching and practicing EBP in optometry were identified, the frequency at which the *lack*

274 *of time* barrier was cited was much greater than for all other barriers. *Lack of time* was selected in the  
275 top 5 by most participants (17 out of 25) and attracted the highest total score of 75, well above the total  
276 score of any other nominated barrier (Figure 3). In fact, *lack of time* was ranked as the top barrier  
277 (attracting a score of 5) by 13 participants. Although well behind, other important barriers consisted of  
278 *negative attitude to EBP* (9 votes, total score 29), *volume of evidence* (8 votes, total score 26),  
279 *integration with clinical practice* (6 votes, total score 24) and *lack of lifelong learning mindset* (6 votes,  
280 total score 21) (Figure 3). An additional two barriers were nominated by many participants but generally  
281 attracted low rankings and these were *understanding statistics* and *lack of evidence* (Figure 3). These  
282 last two items attracted 9 and 8 votes, respectively, but low total scores of only 15. We speculate that  
283 this low ranking may be because these items are considered very important to good EBP practice but  
284 perhaps perceived by our group of educators as easier to overcome than other barriers such as time.  
285 Interestingly, none of the 14 barriers specific to EBP teaching (see knowledge/ curriculum in Table,  
286 Supplemental Digital Content 2) were rated as highly by workshop participants as those related to  
287 practice.

288

289 Responses to the feedback questionnaire indicated that most (17/19; 89%) participants found the  
290 workshop discussions extremely or very useful. Some participants indicated that they would have liked  
291 more focus on the process of EBP, suggesting that, for our sample of optometry educators, enhanced  
292 EBP knowledge and skills would have been helpful. For example: “*All helpful but still not sure how to*  
293 *actually apply...*” and “*I thought we would learn to search [for evidence] ourselves*” and “*Didn’t really*  
294 *find out how to effectively do EBP*”. Attendees appreciated the multidisciplinary input: “*It was good to*  
295 *have representatives from [optometry], medicine [and] speech therapy here and to share their*  
296 *experiences*” and “*It was great to see how other professions do this, e.g. speech pathology and*

297 *medicine*” and “*Good to have multidisciplinary inputs*”. Educators also felt that the panel discussion was  
298 helpful: “*The discussion on overcoming barriers was very helpful*” and “*Good ideas of teaching methods*  
299 *[and] how to overcome barriers*” although one respondent stated that the “*Panel discussion was*  
300 *interesting but lacked detail to be useful*”. This feedback will inform the development of future iterations  
301 of the workshop.

302

303 Finally, while all 18 participants who had completed the EBPAS prior to the workshop were invited to  
304 complete it a second time, one week after the conclusion of the workshop, responses were received  
305 from only 11. Attitudes to EBP did not change significantly following the workshop (Wilcoxon signed  
306 ranks test,  $p=0.76$ ) in these 11 participants. This may reflect the relatively positive attitude measured at  
307 the outset, but may also be due to the small sample size. The interval between evaluations may also  
308 have been too short (one week) to allow for a significant change in attitudes to occur. There was no  
309 significant difference in baseline EBPAS scores between the 11 participants who completed the  
310 questionnaire both before and after the workshop and the seven who only completed it prior to the  
311 workshop (Mann-Whitney test,  $p=0.33$ ).

312

### 313 **Discussion**

314 EBP cannot be implemented effectively without health practitioners having the competency required to  
315 practice it. This is facilitated in part by education to develop relevant knowledge, skills and attitudes in  
316 this area. However, EBP education requires educators who themselves understand and have adopted  
317 EBP. The workshop described here is a pilot intended as a basis for designing of future workshops or



318 courses of this kind for optometry educators, including practitioners teaching within optometry  
319 curricula.

320

321 The workshop was designed to explore perspectives of EBP and develop understanding of the meaning  
322 of EBP using a mix of activities. A proportion of our educators arrived at the workshop with a high level  
323 of understanding of the concept of EBP and teaching methods for EBP. The EBP-related learning and  
324 teaching strategies identified by this group of optometric educators include those requiring students to  
325 present and discuss findings in grand round format, and encouraging students to ask questions, as well  
326 as alignment with the five EBP steps . Interactive learning of this kind is thought to be an important part  
327 of effective learning and teaching for EBP<sup>40</sup> and alignment of EBP teaching with the five steps of the EBP  
328 process has been recommended for EBP teaching.<sup>2</sup>

329

330 This was not a skills development workshop, so EBP knowledge and skills were not measured and the  
331 extent to which we can comment on participants' understanding of EBP is limited. However, we  
332 measured attitudes toward EBP before and in some participants also after the workshop.<sup>31</sup> Overall,  
333 optometry educators' attitudes towards EBP were positive. We chose to use the 50-items version of the  
334 EBPAS scale over the initial (truncated) EBPAS-15,<sup>41</sup> which would have sampled the domains of  
335 divergence, openness, requirements, and appeal only. Had we used the EBPAS-15, our sample of  
336 optometrists would have yielded similarly positive values of  $2.8 \pm 0.4$  (range 1.8 to 3.8).

337

338 We have previously reported similar findings<sup>30</sup> from a qualitative study of optometry practitioners.

339 Studies conducted on other health professionals have also shown largely positive attitudes towards EBP

340 and research use in practice.<sup>15, 33, 42</sup> Negative comments about EBP (e.g., “*treatment may be delayed and*  
341 *may stifle creativity*”) were made by at least one optometric educator. In our survey of Australian and  
342 New Zealand optometrists, 14 (20%) respondents who made comments on EBP also voiced broadly  
343 negative comments, indicating that evidence-based practice is unimportant or unhelpful to optometry.<sup>10</sup>  
344 Interestingly, the present findings suggest that younger optometrists and those recently trained may  
345 have more positive attitudes to EBP than older educators or those who have trained a long time ago.  
346 Similarly, a negative correlation between age and EBPAS score was demonstrated in physicians.<sup>34</sup> A  
347 systematic review previously suggested that physicians who have been in practice longer may be at risk  
348 for providing lower-quality care.<sup>43</sup> This may simply be a reflection of the relatively recent introduction of  
349 an EBP focus to the healthcare professions and their associated educational facilities.<sup>1-3, 5</sup>

350

351 We were unable to demonstrate improved attitude to EBP following workshop attendance. The very  
352 positive attitude towards EBP measured in our participants prior to the workshop and the small sample  
353 size (11 participants completed EBPAS post workshop) may have limited the potential to measure a  
354 significant improvement. The interval of one week between the pre and post workshop assessments  
355 may also have been too short for a detectable change in attitude to occur. These findings should also be  
356 viewed in light of the fact that we did not validate the modified EBPAS prior to its use; it may therefore  
357 simply lack sufficient validity to measure and detect changes in EBP attitudes when used in  
358 optometrists. In fact, the questionnaire may be limited by a potential mismatch between individual  
359 items of the EBPAS-50 and the contemporary definition of EBP.<sup>1,2</sup> In particular the *Appeal* sub-scale  
360 includes item 9 “*If you received training in a therapy or intervention that was new to you, how likely*  
361 *would you be to adopt it if it was intuitively appealing?*” indicates a positive attitude to EBP on the  
362 EBPAS scale. Yet, such a response suggests blind acceptance of therapies based on nothing but intuitive

363 appeal. This appears contrary to the accepted definition of EBP which requires practitioners to integrate  
364 the best research evidence with findings from their clinical examinations and the patient's values and  
365 preferences.<sup>1,2</sup> In addition, the Appeal subscale items are intended to assess the extent to which EBP  
366 appeals to the respondent, but refer to 'therapy' in general rather than specifying EBP. Thus, there is a  
367 need for validation of the EBPAS scale before any wider application of the questionnaire in optometry.  
368 While the EBPAS indicated that our sample of optometry educators held a favourable attitude toward  
369 EBP, this finding should be viewed in light of the limitations outlined above.

370

371 Participants' views on the most important factors that prevent them from teaching and/or practicing  
372 EBP were also gathered. The advantage of the nominal group technique over other qualitative methods  
373 such as focus groups and individual interviews is that it allows some quantitative data to be collected in  
374 the form of ranking. When using this technique all participants are offered an opportunity to participate  
375 and no one participant is allowed to dominate discussions as could perhaps occur in focus group studies.  
376 Previous work on barriers to EBP has repeatedly shown that in a range of health disciplines 'time' is a  
377 significant barrier to EBP.<sup>15, 33, 42</sup> Our results in this small group suggest that the same applies in  
378 optometry: at least in this small group, time is the biggest factor preventing educators and practitioners  
379 from teaching and practicing EBP.

380

381 This raises the question of how such barriers can be overcome. In other health disciplines, a range of  
382 approaches have been used. For example, Allied Health Evidence is an online database through which  
383 practitioners can gain rapid access to up-to-date research evidence relevant to speech pathology,  
384 occupational therapy, psychology and physiotherapy, with each piece of evidence rated independently  
385 in terms of validity.<sup>44</sup> No such database exists for optometry, but other resources are available. Examples

386 include the Cochrane Eyes and Vision Group systematic reviews,<sup>45</sup> the Translating Research Into Practice  
387 (Trip) database<sup>46</sup> and evidence-based clinical guidelines such as those maintained by the American  
388 Optometric Association,<sup>47</sup> the British College of Optometrists<sup>48</sup> or the Australian Government's National  
389 Health and Medical Research Council (NHMRC).<sup>49</sup> Recent qualitative research suggests that optometrists  
390 could make more extensive use of existing guidelines.<sup>30,50,51</sup> Further, existing resources are unlikely to  
391 address the wide range of clinical questions faced by optometrists. A resource like the Allied Health  
392 Evidence may ultimately be needed for optometry.

393

394 The generalizability of our workshop findings to other optometry institutions in the region and  
395 worldwide is uncertain. However, the findings outlined above have formed the basis of further  
396 workshops of this kind being developed and delivered for optometry educators internationally, including  
397 both face-to-face and online delivery. The findings also led to the instigation of an Australian EBP  
398 Optometry Interest Group whose meetings include activities aimed at sharpening EBP skills and  
399 knowledge (such as critical appraisal, finding evidence, and the application of evidence in clinical  
400 decision making). With appropriate modification the workshop described here may be applied in any  
401 optometric education setting, to raise awareness of the significance of EBP and factors related to  
402 educational practice in optometry, to generate discussion on EBP teaching methods for optometry, and  
403 also as a precursor to further development of the relevant skills, knowledge and attitudes in optometric  
404 practitioners and educators.

405

406 **Acknowledgements**

407 Funding was provided by the Australian Government Office for Learning and Teaching Grant Project  
408 ID11-1988. This work was presented in part at the American Academy of Optometry Annual meeting  
409 held in Seattle, USA on 23-26 October 2013. We thank Mr. Duncan Smith and Mr Tim Salmon from the  
410 School of Mathematics and Statistics at the University of New South Wales for providing the facilities  
411 and IT support for the workshop. Professor Rob Jacobs, Associate Professor Peter Henticott and Dr  
412 Michael Pianta provided expert feedback on the EBPAS scale.

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## Figure Captions

Figure 1: Optometrists' attitudes to EBP. Scores of the modified Evidence Based Practice Attitude Scale (EBPAS)-50 for optometry are shown in each of the 12 domains, for the 18 workshop participants who completed this questionnaire prior to the workshop. The boxplot shows median scores (horizontal black lines) and the range of scores for each domain. Open circles and asterisk show outliers, which occurred only in the domains of Fit and Limitations. Patterned bars indicate those domains where a positive EBP attitude attracts a low score.

Figure 2: The relationship between optometrists' attitudes to EBP measured by the Evidence-Based Practice Attitude Scale (EBPAS)-50 score and age (A) and time (years) since graduation (B). Attitude to EBP worsened with increasing age ( $\rho=-0.57$ ,  $p=0.01$ ) and as time since graduation increased ( $\rho=-0.57$ ,  $p=0.01$ ).

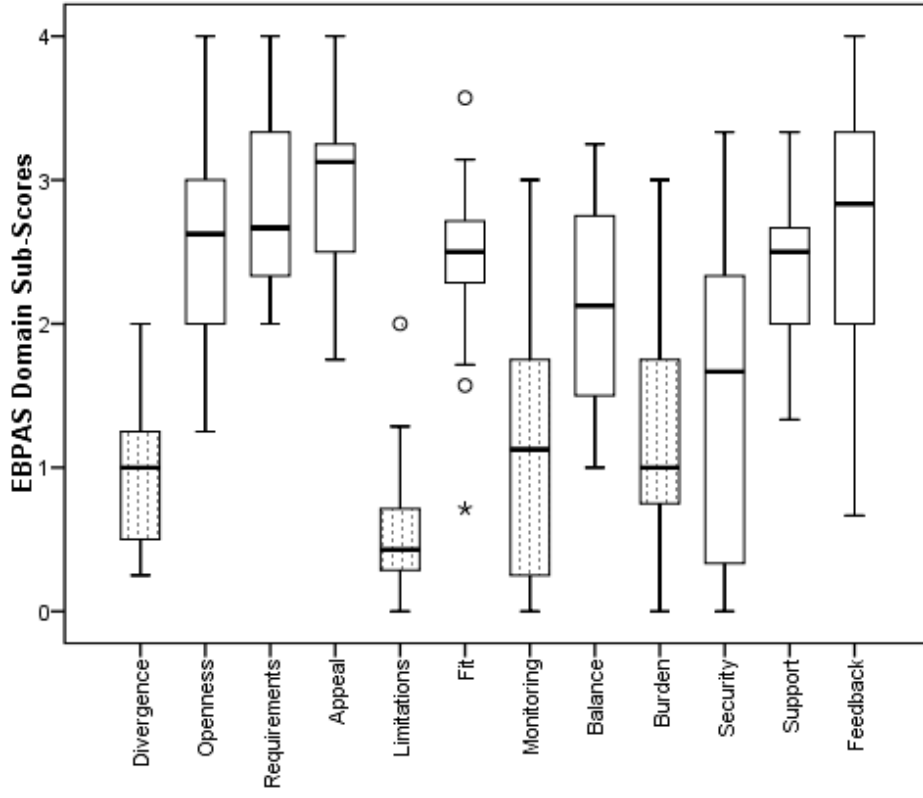
Figure 3: Optometric educators' answers to the question (A) *What does evidence-based practice mean to you, and what is its significance to optometry?* And (B) *What strategies do you use to teach optometry students to be evidence-based practitioners?*

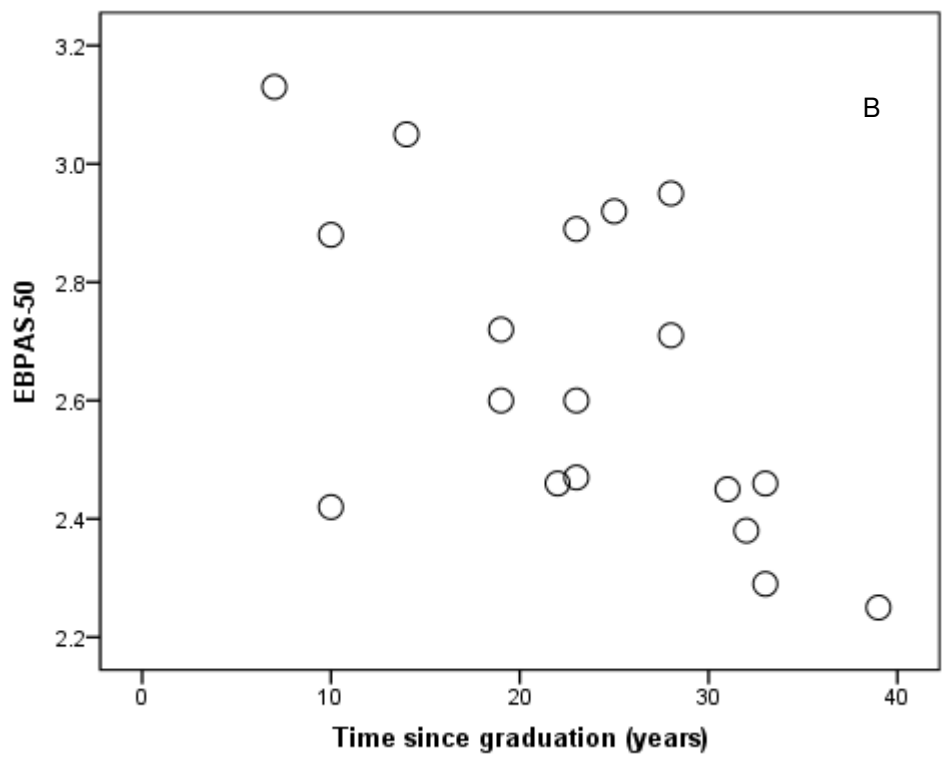
Figure 3: Barriers to EBP. The most frequency cited (primary y-axis) and highest scoring (secondary y-axis) top five barriers to EBP in optometry. The y-axis on the left is associated with the bars and represents the number of participants that identified these barriers in their top five and the y-axis on the right is associated with the line and represents the top five total score given by workshop participants, based on how important participants felt these were (high score = high importance).

## Supplemental Digital Content Legends

Supplemental Digital Content 1.pdf: The Evidence-Based Practice Attitude Scale (EBPAS) for optometry. The question used and the corresponding domain are shown for each of the 50 items contained in the EBPAS. Respondents were instructed as follows *“The following questions ask about using new types of therapy, interventions or treatments. Indicate the extent to which you agree with each item. Select the most appropriate answer. Choose only answer per question.”* Response options were rated using a categorical scale (see explanatory note\*). Domains are described in the bottom section of the Table.

Supplemental Digital Content 2.pdf: Barriers to EBP in optometry were solicited using a group consensus process. Thematic analysis revealed four themes (time, knowledge / curriculum, attitude, and access). Barriers in grey italics applied to EBP teaching only whereas other barriers applied to EBP practice and EBP teaching. Participants selected and ranked (score of 5 = most important to 1 = least important) their top five barriers. The numbers of votes, the total and average score for each barrier are shown.





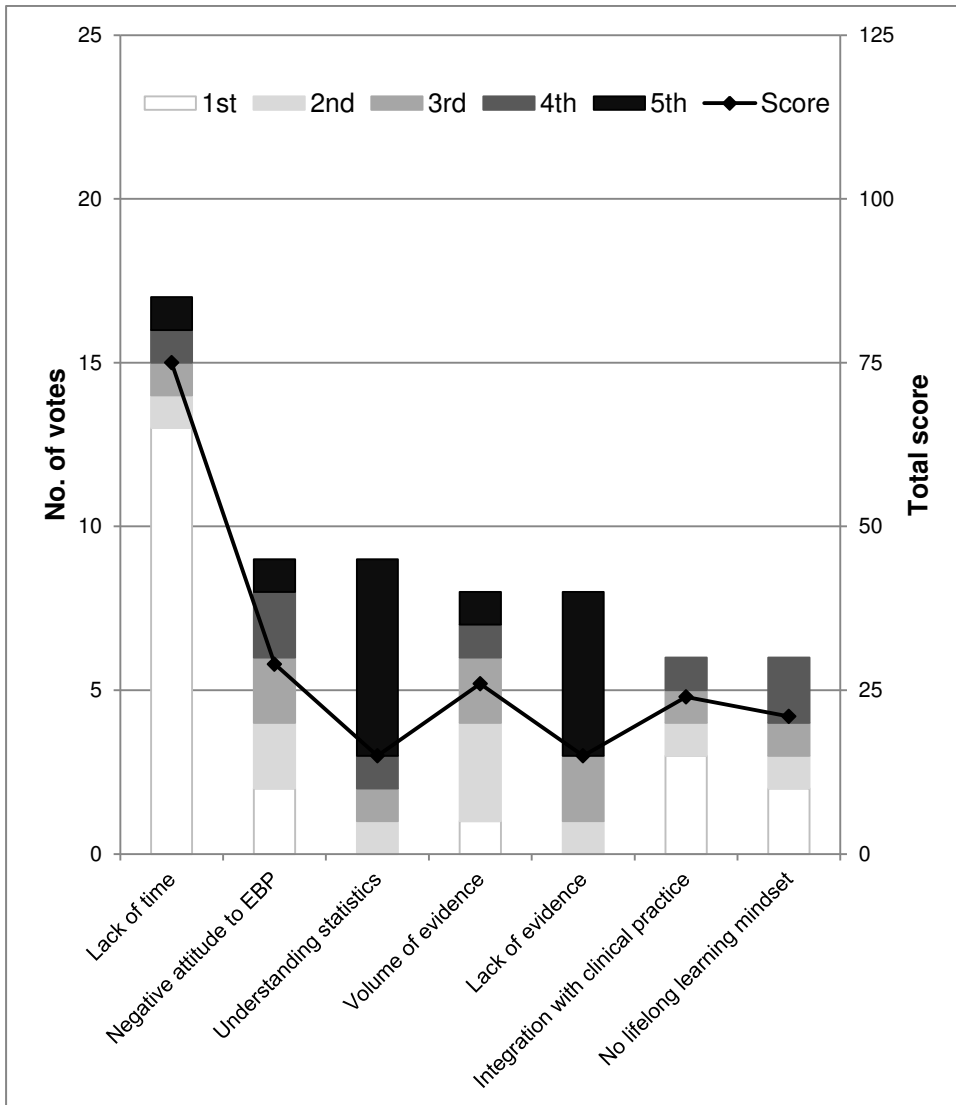




Table 1: Format (teaching method or activity) of individual workshop sessions and the rationale for the chosen format.

Session	Topic	Activity description and characteristics	Rationale
1	What is EBP? – participants' viewpoints	Discussions on the meaning of EBP and its significance to optometry. <i>Small group</i> <i>Interactive</i>	Active learning on the concept and significance of EBP; discussion based on participants' perspectives rather than didactic transfer of knowledge.
2	What is EBP? – definitions and understanding (Sicily statements)	Lecture introducing the meaning of EBP, the concept and the 5-step process. <i>Didactic</i>	To tell participants what EBP is general thought to be, so that participant's understanding is not solely based on the discussions.
3	EBM – practice and teaching	Lecture on EBM and approaches to EBM teaching. <i>Didactic</i>	To allow insight into the Medicine view of EBP and some of the methods used to teach it in this field.
4	EBP in optometry – practice and teaching	Lecture on the significance of EBP in eye care and on approaches to teaching it. <i>Didactic</i>	To show the significance of EBP in eye care, and to present some of the methods used to teach it in the eye care field.
5	Teaching EBP in optometry – participants' viewpoints	Discussion on strategies used by the group to teach EBP in optometry. <i>Small group</i> <i>Interactive</i>	Participants gain insight from hearing about others' teaching strategies and experiences.
6	Barriers to EBP in optometry – participants' viewpoints	Nominal group technique, with barriers to practicing and teaching EBP identified and ranked by participants. <i>Interactive</i>	For participants to identify any barriers to the practice and/or teaching of EBP, and to consider which of these are most problematic.
7	Overcoming barriers to EBP in optometry	Panel discussion of four facilitators from medicine, speech pathology and optometry, with discussion based on questions from participants. <i>Interactive</i>	To allow facilitators with experience in EBP and its teaching to discuss ways to overcome barriers and participants to gain from the facilitators' insight.
8	Introduction to the evidence-based optometry web site	Participants independently exploring a new web-based resource for EBP in optometry ( <a href="http://www.eboptometry.com">www.eboptometry.com</a> ). <i>Self-directed with tutor interaction</i>	To familiarize participants with the new resource and to gather participants' suggestions for its improvement.
9	Where to from here?	Large group summary discussion on any further workshops or other provision would support participants in their EBP teaching.	To seek suggestions from participants on their training needs as EB practitioners and EBP

		<i>Evaluation questionnaire</i>	teachers. To obtain feedback on potential modifications to future iterations of the workshop.
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Table 2: Demographic characteristics of workshop participants.

	<b>EBPAS questionnaire</b> n (%)	<b>Barriers to EBP session</b> n (%)
Number of participants	18	25
Age*	45 ± 9 range 28 to 61	46 ± 9 range 28 to 62
Sex		
Male	4 (22)	5 (20)
Female	14 (78)	20 (80)
Time since graduation as an optometrist *	23 ± 9 range 7 to 39	24 ± 8 range 7 to 40
Education		
Undergraduate	4 (22)	4 (16)
Postgraduate coursework	9 (50)	10 (40)
Postgraduate research	5 (28)	11 (44)
<i>“With regards to EBP, you consider yourself?”</i>		
Novice	10 (56)	12 (48)
Intermediate	7 (39)	8 (32)
Expert	1 (5)	5 (20)
<i>“Which option BEST describes you?”</i>		
Academic	6 (33)	13 (52)
Clinical Supervisor	9 (50)	9 (36)
Practitioner	3 (17)	3 (12)
Business / Administrator	0 (0)	0 (0)
Registration		
Optometrist not accredited for therapeutic practice	14 (78)	16 (64)
Optometrist accredited for therapeutic practice	4 (22)	7 (28)
Allied health or medical practitioner	0 (0)	2 (8)

\* values are mean ± standard deviation

Table 3: Optometric educators' answers to the question (A) *What does evidence-based practice mean to you, and what is its significance to optometry?* and (B) *What strategies do you use to teach optometry students to be evidence-based practitioners?*.

(A) EBP Meaning and Significance in Optometry
<ul style="list-style-type: none"> <li>• Application of the best available research to clinical decision-making</li> <li>• Patient-informed/patient-centred clinical decision-making</li> <li>• Consistency of approach across the profession</li> <li>• Legal defense for the practitioner</li> <li>• Justification for clinical decision-making</li> <li>• Credibility for the profession</li> <li>• Use of guidelines</li> <li>• Lifelong learning</li> <li>• Better patient care</li> <li>• Clinical experience combined with research evidence</li> <li>• Combats commercial pressures</li> <li>• Treatment may be delayed while awaiting evidence</li> <li>• EBP may stifle creativity</li> </ul>
(B) EBP Optometry Teaching Strategies
<ul style="list-style-type: none"> <li>• Self-directed learning with guidance</li> <li>• Case-based learning</li> <li>• Research methods including ethics and peer review, statistical concepts and methods</li> <li>• Point out knowledge gaps</li> <li>• References provided in lecture notes</li> <li>• Librarian teaching literature search integrated with 5 steps of EBP</li> <li>• Critical reading skills required for assessment tasks</li> <li>• Informally point out levels of evidence: cite specific examples during lecture</li> <li>• Online discussions including critique of evidence</li> <li>• Grand rounds, student case presentations and discussions</li> <li>• Evidence cited during decision-making in clinic</li> <li>• Effective clinical mentoring – students are asked questions, not just given answers</li> </ul>