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ORIGINAL RESEARCH

Trainee attitudes towards virtual reality simulation to develop microsurgical skills in ophthalmology

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ABSTRACT

Introduction:
Virtual reality simulation (VRS) is an established technology for training cataract surgery. It has been validated for numerous ophthalmic surgical modules. The learner's attitude towards its use has not been explored. This study has examined ophthalmology trainees' attitudes towards VRS at the commencement of their training, before undergoing live surgery.

Methods:
All Royal Australian and New Zealand College of Ophthalmology (RANZCO) trainees commencing in 2022 were invited to participate voluntarily in the research. Trainees completed an online mixed-methods questionnaire containing items on simulators, surgical experience and confidence levels in their surgical skills. Trainee attitudes were gathered utilizing Likert scale items, certainty-based and open-ended questions. The data were analysed by running basic descriptive statistics and frequencies utilizing SPSS.

Results and Discussion:
Ophthalmology trainees believe that VRS can improve theatre skills, including reducing levels of complications in live surgery (91.7%), developing clinical decision-making (83.3%) and enhancing patient safety (87.5%). It was clear that the trainees felt that VRS training was helpful to increase pre-operative (91.7%) and intra-operative confidence (91.7%). The role of VRS in future training was unclear. Forty percent of trainees did not believe that VRS will be useful as they progress through their career.

Conclusion:
Ophthalmology trainees value VRS training to develop microsurgical skills, though they are unclear about its benefit in the later stages of training. They possibly perceive VRS as a bridge to live surgery, not realizing its full potential to further enhance their skills. The authors recommend including in the VRS training curriculum standard a section highlighting its ongoing benefits for practice beyond commencing training.

Introduction

Virtual reality education has evolved rapidly over the past decade and has changed the teaching and training of microsurgical skills in trainee Ophthalmologists [1–3].

The Eyesi virtual reality simulator (VRS; VRmagic© – Haag-Streit, Mannheim, Germany) is the predominant simulator used for training in both cataract and vitreoretinal surgery [4]. Construct validity studies have shown that it can distinguish between novice, intermediate and experienced surgeons [5,6]. This validation covers numerous cataract surgery modules for emulsification, alongside other surgical modules including anterior segment forceps, anti-tremor, capsulorhexis, navigation, tracking and chopping [6–9]. It has been demonstrated to reduce the number of complications from live surgery in early trainees [9] and the technical skills acquired utilizing VRS training are transferable to the operating theatre [1]. VRS allows trainee Ophthalmologists to practice every step of the phacoemulsification procedure, apart from corneal incisions. Its automated assessment categorizes performance in five domains: target achievement, efficiency, instrument utilization, tissue damage and microscope usage [9].

Within medical education, virtual simulation-based training is a method for learning and practicing clinical skills in a virtual environment [10]. Surgical simulation is now being utilized across several surgical specialties [11]. With VRS scenarios from a clinical setting are substituted with experiences within a virtual one. These environments allow for practice of different skills and techniques in a risk-free manner [12]. They also allow for engagement in deliberate practice of specific components of technical skills [13].

Attitude is a psychological construct that affects self-regulation and motivation to engage in a learning task [14,15]. A positive attitude towards a learning task helps trainees set goals, structure their learning environment and manage their time effectively. It also allows them to design a task strategy, seek expert help and reflect on their learning [16]. These self-regulation subscales work in conjunction with motivation. A positive attitude is associated with high self-efficacy and task value [17,18]. Learners who attach a high value to a learning task will invest time and effort to complete it [19]. As a result, they will achieve the intended learning outcomes.

This study was aimed at gauging commencing ophthalmology trainee attitudes towards VRS training. Understanding their initial attitude will be the first step to linking it with attaining microsurgical skills.

Methods

Ethics

This project was approved by the Royal Australian and New Zealand College of Ophthalmology (RANZCO) Human Resources Ethics Committee (approval number: 128.21).

Survey design and participants

This research utilized a mixed-methods survey, which gauged quantitative and qualitative data [20]. First-year RANZCO trainees commencing training in February 2022 were invited to participate in the study. The survey tool was sent to the trainees as a broadcast email through the RANZCO email service, with a repeat reminder 2 weeks later. Participation in the survey was anonymous and on a volunteer basis, with no bearing on ongoing training.

A 34-step questionnaire was administered to trainees to assess their baseline surgical experience, surgical skills and attitudes towards learning with VRS (Tables 1 and 2). The development of the questionnaire was informed by previous studies examining surgical skills [8,21], the use of VRS in surgical training [13] and learning attitudes [22,23]. The first part of the questionnaire focussed on surgical experience, including time spent in operating theatres and what capacity (observing, assisting or leading). Additional information on previous experience in ophthalmological surgeries and their role within the operating theatre was collected. Data on prior experience with video games were collected, as it may impact engagement with VRS [21]. Data on prior musical experience were collected based on work by Ericsson et al. [24], and the potential that previous involvement in musical training (and its potential for deliberate practice), as it may impact the uptake of ‘deliberate practice’, thereby influencing attitudes towards VRS as a tool for ongoing improvement and attainment of expertise [24].

The study utilized a Likert scale to assess trainees’ attitudes towards VRS to develop microsurgical skills and its potential utility in training. Trainees were asked to respond to a series of statements on a Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). An additional option of ‘unsure’ was also included but did not form part of the Likert scale.

Trainees could provide additional free-text comments on their experiences in every questionnaire section. This utilized open-ended questions such as: ‘*Do you have any additional comments?*’.

Survey data were collected anonymously and managed using Zoho survey tools [25], RANZCO Customer Relationship Management solution hosted on the RANZCO secure database.

Statistical analysis

The data were analysed by running basic descriptive statistics and frequencies using SPSS (IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.) [26]. Qualitative data were utilized to provide further insights into trainees’ attitudes.

A thematic analysis was not completed due to the small numbers of responses to the open-ended questions.

Results

In total, 27 of 32 trainees attempted the survey (83% response rate). The questionnaire was entirely completed by 24 out of 27 (88.9%). The three participants who did not entirely complete the questionnaire only answered the baseline component of the survey. The baseline data are summarized in Table 1. The cohort comprised 77.8% (n = 21) males and 22.2% (n = 6) females. Most trainees were from Australia (n = 22; 81.5%) rather than New Zealand (n = 5,

Table 1: Baseline statistics

Question	*N*	Min	Max	Mean	SD
Approximately how many hours have you spent in the operating theatre since graduating from medical school?	27	20	5000	646.30	1096.084
Has any of your surgical experience been in ophthalmology? Include assists and observations	24	1	2	1.04	.204
Approximately how many hours have you spent in the operating theatre in ophthalmology since graduating from medical school?	23	5	1000	270.78	297.351
Approximately what percentage of your total operating theatre time included the following activities?					
Observing	27	4	90	30.81	24.877
Assisting	27	10	95	60.30	23.486
Leading	27	0	56	8.89	14.818
Approximately what percentage of your total operating theatre time included the following activities?					
Observing	23	0	95	30.74	30.468
Assisting	23	5	100	60.43	29.190
Leading	23	0	57	8.83	15.423
Approximately what percentage of your total operating theatre time included the following activities?					
Observing	23	0	95	30.8	30.468
Assisting	23	5	100	60.3	29.19
Leading	23	0	57	8.9	15.42
How many cataract surgeries have you been involved in since graduating from Medical School?					
Observing	23	0	200	45	59.78
Assisting	23	0	400	93.5	109.00
Leading	23	0	93	11.9	26.85
	0 h	1 h	2 h	3 h	≥4 h
Approximately how many hours per day on average would you say you play/ have played computer games?					
At school	45.8% (11)	37.5% (9)	8.3% (2)	4.2% (1)	4.2% (1)
At university	58.3% (14)	25.0% (6)	12.5% (3)	0%	4.2% (1)
Currently	87.5% (21)	12.5% (3)	0%	0%	0%
Approximately how many hours per month on average would you say you play/ have played musical instruments?					
At school	29.2% (7)	29.2% (7)	20.8% (5)	8.4% (2)	12.5% (3)
At university	62.5% (15)	16.7% (4)	16.7% (4)	0%	4.2% (1)
Currently	87.5% (21)	8.4% (2)	0%	0%	4.2% (1)

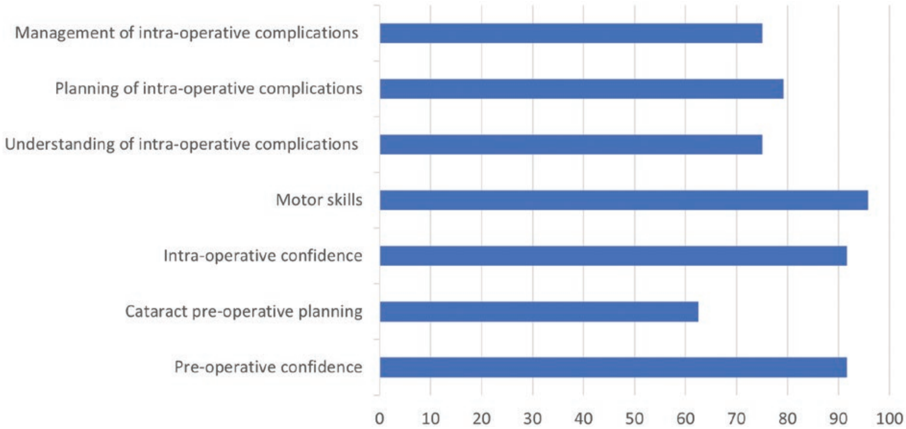
18.5%). Using the RANZCO rural calculator 44.4% (n = 12) were considered rural/regional, with the remainder originating from an urban area. The RANZCO rural calculator scores trainees' rural exposure from 1 to 5, with those scoring >3 counting as rural trainees.

All trainees had surgical experience within the operating theatre, with an estimated average of 646 hours in any capacity (Table 1). The majority of that time had been spent assisting (60.3%). Only one trainee (3.7%) did not have prior experience in any Ophthalmological theatre. The other trainees had an estimated average of 297 hours of experience in an Ophthalmological operating theatre. Considering cataract surgery specifically, 81.5% of trainees (n = 21) had prior experience. Of these, 90.5% had experience observing or assisting (n = 19). Few trainees reported previous experience leading cataract surgery (23.8%, n = 5).

The trainees surveyed believed VRS' would assist them in the attainment of skills (79.2%, n = 19), retaining knowledge (87.5%, n = 21) and improving motor skills (95.8%, n = 23). They also felt it would improve some theatre skills, including reducing levels of complications in live surgery (91.7%, n = 22), developing clinical decision-making (83.3%, n = 20) and enhancing patient safety (87.5%, n = 21). It was clear that the trainees agreed that VRS training helped them increase pre-operative (91.7%, n = 22) and intra-operative confidence (91.7%, n = 22). They also viewed VRS training as a valuable learning resource. They believed that it offers a beneficial learning strategy (91.7%, n = 22), and makes learning more engaging (87.5%, n = 21) and easier (95.8%, n = 23; Figure 1).

The trainees' view on VRS's role in improving the non-technical aspects of surgery was not evident, with smaller proportions believing that VRS increased confidence in dealing with patients (66.7%, n = 16), improved cataract

Figure 1: Repeated use of VRS and improvement in operating theatre skills.



pre-operative planning (62.5%, n = 15) and was useful in the development of behavioural skills (62.5%, n = 15).

Half of the trainees (n = 12) had previous surgical simulator experience after graduating from medical school. Most trainees (87.5%, n = 21) believe that VRS would be a helpful learning tool for developing microsurgical skills. In contrast, the remaining 12.5% (n = 3) thought that it would be 'somewhat' helpful.

Of trainees who played video games 54.2% (n = 13) of trainees had played a minimum of 1 hour per day at school, with a corresponding decrease to 12.5% (n = 3) playing 1 hour per day at the time of the survey. Approximately, half of the trainees (54.2%, n = 13) had previous experience in playing a musical instrument regularly during high school, with a decrease to 12.5% (n = 3) at the time of the survey.

There was a significant decrease in the proportion of ophthalmology trainees who believed that VRS during both basic and advanced training, and after the completion of the training program compared to those believing that it would be useful during basic training (p = 0.025). This was consistent across all baseline statistics including gender, rurality, previous surgical experience and hours of computer games/musical instruments played.

Discussion

This research examines trainee attitudes towards VRS training before the beginning of their RANZCO Vocational Training Program (VTP). The program currently requires that trainees complete a course in VRS before performing live surgery on patients.

VRS training is more efficient than traditional apprenticeship training at the beginning of the learning curve [1]. When compared to no intervention, training on simulators has shown large effects on knowledge, skills and behaviours, alongside moderate effects on patient-related outcomes across multiple medical and surgical fields [27]. The Eyesi VRS is multiply validated across multiple steps of cataract surgery including modules for emulsification, alongside other surgical modules including anterior segment forceps, anti-tremor, capsulorhexis, navigation, tracking and chopping [6–9]. Thomsen et al. demonstrated that surgeons who had already started operating on patients (<75 operations) received a significant beneficial effect from virtual reality training and there was a significant decrease in VRS effectiveness at approximately 100 operations [28]. VRS in this context may have an important role in learners as well as experienced surgeons who are returning from time away from surgery (pandemic, maternity, leave for any other reason). Commencement of VRS at the beginning of training will help reduce complication rates [9] as well as maximize the potential benefits of VRS on microsurgical skills.

The ophthalmology trainees surveyed, reported VRS training as a valuable learning tool in their early training and felt it would help them in developing their technical skills and confidence, reducing complications and improving patient safety. This positive attitude towards VRS aligns with simulation learning in other medical specialities [29,30]. This positive attitude changed as the trainees were asked to consider the ongoing utility of VRS throughout training (Figure 3). It was seen to be progressively less helpful as both clinical seniority and experience increased.

There is no current literature examining attitudes towards VRS education, nor its impact over a sustained period, in ophthalmology.

Attitudes towards learning

A positive attitude towards a learning topic is correlated and predictive of academic achievement [14]. This has been investigated within the educational literature, and has been shown to be independent of cognitive and affective factors such as intelligence quotient, working memory, general attitudes and anxiety [23]. A positive attitude towards a learning topic can reduce anxiety about learning, and enhance motivation to succeed [31] alongside boosting persistence and effort during learning [32]. Consequently, a negative attitude towards a learning topic has been associated with reduced cognitive flexibility towards problem-solving, and worse academic outcomes [33,34].

The ophthalmology trainees perceived VRS training positively: as a learning resource, a valuable learning tool and that it would likely assist with improvements in theatre skills (Table 2 and Figure 2). This positive attitude will help

Table 2: Likert scale table

	Strongly agree	Disagree	Agree	Strongly agree	Unsure
The Eyesi simulator....					
• Can offer a valuable learning strategy	0%	0%	20.8% (5)	70.8% (17)	8.3% (2)
• Can provided a realistic learning environment	4.2% (1)	8.3% (2)	54.2% (13)	25% (6)	8.3% (2)
• Can help enhance the safety of my patients	0%	0%	29.2% (7)	58.3% (14)	12.5% (3)
• Can help improve my pre-operative planning for cataract cases	0%	16.7% (4)	41.7% (10)	29.2% (7)	12.5% (3)
• Can help develop my behavioural skills* in cataract surgery	8.3% (2)	12.5% (3)	29.2% (7)	33.3% (8)	16.7% (4)
• Is only beneficial in basic ophthalmic training	4.2% (1)	45.8% (11)	12.5% (3)	16.7% (4)	20.8%
• Will be beneficial in advanced ophthalmic training	0%	0%	37.5% (9)	29.2% (7)	33.3% (8)
• Will be beneficial BEYOND advanced training	0%	8.3% (2)	25.9% (7)	25% (6)	37.5% (9)
• Will not be required for my surgical once I pass RANZCO requirements	8.3% (2)	41.7% (10)	8.3% (2)	0%	41.7% (10)
• Can make my learning more engaging	0%	12.5% (3)	50.0% (12)	37.5% (9)	0%
• Can make my learning easier	0%	4.2% (1)	54.2% (13)	41.7% (10)	0%
• Can help me retain knowledge	0%	12.5% (3)	62.5% (15)	25% (6)	0%
• Can reduce my levels of complications in live surgery	0%	8.3% (2)	62.5% (15)	29.2% (7)	0%
• Can develop my clinical decision-making	0%	16.7% (4)	62.5% (15)	20.8% (5)	0%
The repeated use of Eyesi can improve my...					
• PRE-operative confidence	0%	4.2% (1)	50.0% (12)	41.7% (10)	4.2% (1)
• PRE-operative planning for routine cataract cases	0%	25% (6)	37.5% (9)	25.0% (6)	12.5% (3)
• INTRA-operative confidence	0%	4.2% (1)	50.0% (12)	41.7% (10)	4.2% (1)
• Motor skills	0%	0%	37.5% (9)	51.9% (14)	4.2% (1)
• Understanding of intra-operative complications encountered in live surgery	0%	12.5% (3)	41.7% (10)	33.3% (8)	12.5% (3)
• Planning of intra-operative complications encountered in live cataract surgery	0%	8.3% (2)	45.8% (11)	33.3% (8)	12.5% (3)
• Management of intra-operative complications encountered in live surgery	0%	4.2% (1)	41.7% (10)	33.3% (8)	20.8% (5)
I...					
• Believe the EVRS can help my increase my confidence in dealing with patients	0%	25% (6)	37.5% (9)	29.2% (7)	8.3% (2)
• Feel comfortable engaging with the RANZCO simulator training program	0%	0%	54.2% (13)	37.5% (9)	8.3% (2)
• Understand how much time I will need to use Eyesi to be competent in live surgery	8.3% (2)	20.8% (5)	29.2% (7)	16.7% (4)	25.0% (6)
• Believe the data from the Eyesi simulator will be useful to improve my skills	0%	0%	41.7% (10)	37.5% (9)	10.8% (5)

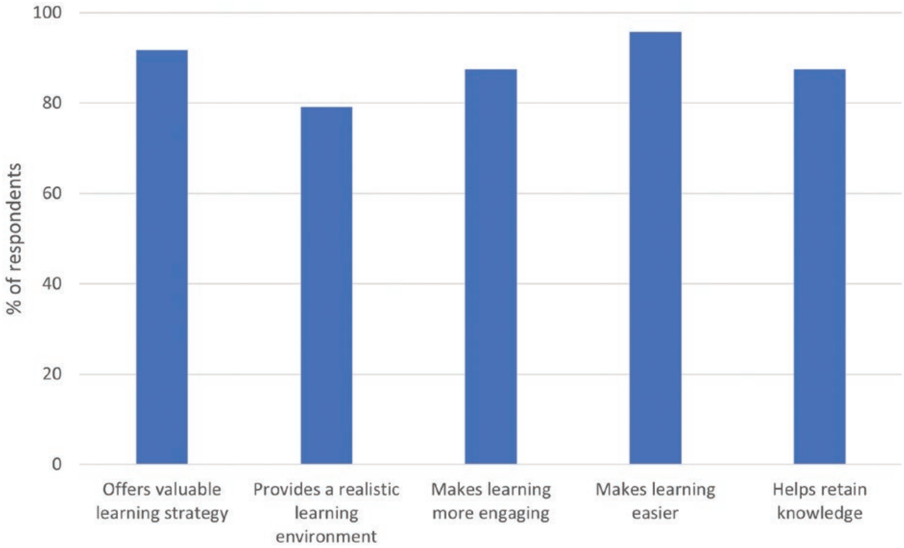
initial engagement with VRS training within the RANZCO VTP [14,23].

The attitudes of ophthalmology trainees towards VRS significantly decreased relative to the length of time within training (p = 0.025). An increasing negative attitude towards VRS as training continues may impact engagement with VRS and reduce the ability to engage in deliberate practice, as discussed below. This could also impact ongoing professional development, as the less value a student places on a task (such as VRS), the less likely they are to continue to practice and engage with it [34].

Deliberate practice

Learning is most efficient when learners are actively involved either physically or mentally, with the learning process [35,36]. Traditional surgical training follows a Halsteadian model of teaching – 'see one, do one, teach one' [37]. This surgical apprenticeship method is adapting to changing working conditions, reduced working hours and concerns for patient safety [38]. There is growing evidence for deliberate practice (a focussed effort that is not inherently enjoyable with a goal of personal improvement) in improving surgical performance and developing expertise [39].

Figure 2: VRS as a learning resource.

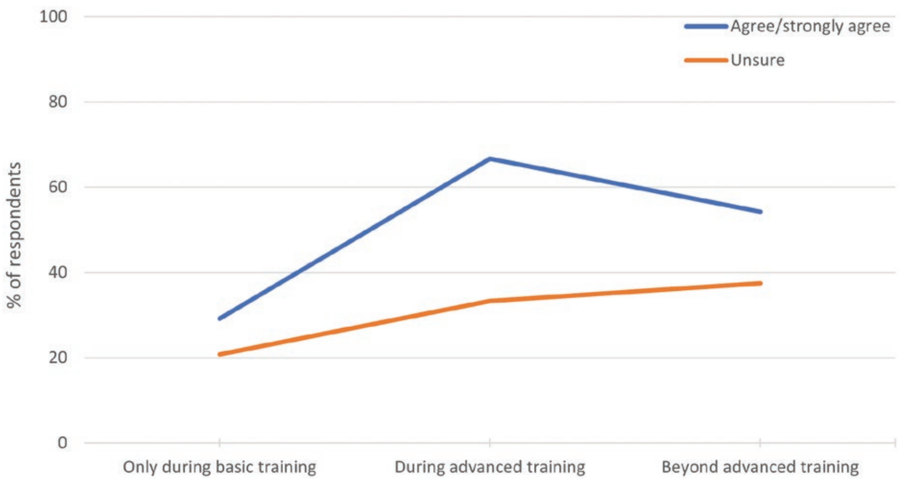


VRS training is a vehicle that can be used to facilitate reliable and reproducible deliberate practice, improving outcomes within the operating theatre [13]. Ericsson et al. (1993) describe deliberate practice as a task that is effortful, with the primary goal of personal improvement or performance, rather than enjoyment and is performed without immediate reward [24]. It involves focussing on a small component of a more significant task until it is mastered, rather than pure repetition of the large task at hand [24]. These are all features shared with VRS, and with which VRS excels.

Multiple studies have demonstrated that improvements in surgical outcomes are related to an increased volume of surgical cases completed by the surgeon [40–42]. Pure repetition of tasks, however, has been associated with a plateau in the improvement of skills before maximal levels are achieved [43]. Deliberate practice has been shown to prevent plateau and assist in expertise formation if used regularly and consistently. This is true across various professions requiring precision – musicians, typists and professional athletes [24]. If we compare expert musicians and amateurs, there are large differences in the amount of time spent utilizing deliberate practice [24]. This suggests that the key to attaining expertise and ongoing improvement is time spent in deliberate practice to achieve maximal levels of expertise and outcomes. This occurs as deliberate practice ensures that specific areas of weakness are targeted and improved upon, as opposed to the quantity of time spent in surgery repeating the task in full [44,45]. Deliberate practice utilizing VRS training has improved operating theatre outcomes and technical performance in laparoscopic surgery [13].

There are, however, significant resource, effort and motivational constraints to deliberate practice [24,45]. Resource constraints are likely to impact ophthalmology trainees through the lack of access to VRS equipment for deliberate practice alongside access to consultant supervisors. Effort constraint relates to the limited amounts of effective daily practice able to be sustained over long periods. Cataract surgery is not the only component of the RANZCO VTP curriculum, with a host of other subjects that require time, attention and effort [46]. Finally, although most trainees would likely like to be experts in ophthalmology, deliberate practice is not inherently enjoyable and it may prove difficult for some trainees to maintain a constant and ongoing motivation and engagement with VRS and deliberate practice.

Figure 3: Percentage of trainees who find VRS useful.



Non-technical surgical skills

Technical skills tend to improve with experience [47] and experience is a recognized moderating factor in managing stressful situations [48]. Ophthalmology trainees in Hong Kong who had completed VRS training (compared to those who had not) had lower perceived difficulties in performing the most technically demanding phacoemulsification procedures and had higher confidence in performing the most difficult tasks perceived during phacoemulsification [3].

Aside from the technical aspects of ophthalmic surgery, there are essential non-technical skills (NTS) that reduce complication rates and improve performance [48,49]. These include leadership, teamwork, communication, situational awareness, decision-making and stress management [50]. Effective NTS are critical for successful intra-operative complication management; however, implementing them in practice is challenging [50].

Interruptions, distraction, time pressure and procedural complexity are all recognized intra-operative stressors [48]. Increased stress intra-operatively is related to an increased incidence of surgical error and poor outcomes [51–53].

VRS training supports the acquisition of technical skills and experience, and thus may play a role in reducing stress associated with the technical aspects of surgery. Deliberate practice and experience with VRS may allow for increased intra-operative focus to be spent by trainees on NTS improvement rather than purely focussing on the technical aspects of surgery. Furthermore, simulation (including VRS) is a viable mechanism for improving NTS [11,54,55]. The trainees are currently somewhat ambivalent about the impact of VRS on their NTS, such as their confidence in dealing with patients, pre-operative planning and behavioural skills. This will be an essential area to revisit in the longer-term study, as the trainees gain more experience with VRS and within the operating theatre.

Surgical learning curve

VRS does not replace operating, and all types of training are best combined with supervised training under a curriculum [8]. The nature of patient cases and time pressure in real surgery trigger emotions and stress that increase cognitive load [56]. Fatigue and the need of multitasking within the operative theatre make real surgery substantially different than a VRS environment [57]. However, VRS has been significantly associated with increased confidence in higher-difficulty microsurgical tasks regardless of training status and previous experience within cataract surgery [3]. Current evidence does not describe the strict changes in the learning curve from VRS, which is yet to be established. A large strength of VRS is that it can break down procedures into key steps, with the benefit being the targeting of the specific steps rather than the procedure as a whole. Furthermore, certain steps of a procedure are threshold concepts, if they are not mastered, they will make the remainder of the procedure more challenging. This is evident within cataract surgery, where steps such as capsulorhexis are critical to every step that consequently follows. Although there is not currently evidence to quantify the benefits to the learning curve overall, breaking down a procedure into small steps and mastery of these may incrementally improve the learner's ability to translate that to live surgical performance.

Recommendations and implications

The impact of VRS on ophthalmology training has been demonstrated internationally to be instrumental in reducing early complication rates and improving surgical outcomes early in ophthalmology trainees' careers [9,28]. Examining trainee attitudes before the commencement of the VTP and live surgery demonstrated that trainees are open-minded to the technology, but have a degree of uncertainty around how beneficial they will find the training, particularly as they progress.

This suggests that informing the trainees of the benefits of VRS before the commencement of the VTP would likely increase trainees ongoing engagement with VRS. Similarly, explaining expertise theory and deliberate practice and its relationship to VRS before commencing the VTP may assist trainees in seeing the utility of VRS as a tool for deliberate practice throughout the training program.

NTS are receiving burgeoning attention in surgical education and practice. Ongoing evaluation of NTS as technical skills improve will be an important area of focus for further research. Furthermore, based on the literature [11], consideration should be given to adding VRS modules targeting NTS to the existing RANZCO VTP curriculum.

Further study design should include randomization of time spent utilizing the simulator as well as the varying tasks within. Prospective study design could assess the gain of VRS and the changes and shortening of the learning curve, outlining its utility in guiding the apprentice surgeon to intermediate.

Ongoing review of the changes in attitudes of trainees throughout their careers, as well as new ophthalmology trainees, will help broaden the evidence base and increase understanding of these attitudes. Monitoring these changes through their careers will allow educators to understand how attitudes towards VRS change throughout a trainee's career and how we can continue to improve engagement with VRS and deliberate practice, and therefore use of deliberate practice and creation of expertise.

The main strength of this study is that it is of a highly select cohort with a high completion rate of 83%. This cohort is split across two countries that will complete a standardized course of VRS as part of the RAZNCO VTP. This makes the study uniquely positioned to review the attitudes and the implications of attitudes on their training experience and outcomes. Furthermore, this study will be repeated over the next 5 years and will give us a longitudinal comprehension of these potential changes in attitude.

Weaknesses of this study include the small cohort, unbalanced cohort in terms of gender (male: female, 21:6) and its external validity. These weaknesses will be addressed further in repeat iterations of the survey of new ophthalmology trainees, which will boost total survey responses, and the number of females and allow for increased external validity due to increased case size.

Conclusion

This study provides a critical understanding of the attitudes of ophthalmology trainees towards VRS training. Their view of VRS is primarily positive. However, the role of VRS as they progress through their training and into careers as consultant Ophthalmologists and continuing professional development was not as clear.

Clear communication of the potential role of VRS, deliberate practice and expertise theory will hopefully increase engagement and allow for expertise development. Improving technical skills in conjunction with NTS will help develop trainees' ability to manage stressful situations and improve surgical outcomes.

Declarations

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Authors' contributions

R.C. and J.R. designed the survey. J.R., S.K. and C.G. analysed and interpreted the data. C.G. wrote the initial draft of the manuscript, and all authors contributed to the revision and finalization of the manuscript. All authors read and approved the final version of the manuscript.

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Availability of data and materials

None declared.

Ethics approval and consent to participate

This research project, with approval number 128.21, was authorized by the Human Research Ethics Committee of the Royal Australian and New Zealand College of Ophthalmology (RANZCO). All participants voluntarily participated and were fully informed about the purpose and procedures of the study, including their right to withdraw at any time without penalty.

Competing interests

None declared.

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