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Author response to: The impact of virtual-reality simulation training on operative performance in laparoscopic cholecystectomy: meta-analysis of randomized clinical trials

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Dear Editor

We thank Toale *et al.* for their correspondence on 'The impact of virtual-reality simulation training on operative performance in laparoscopic cholecystectomy: meta-analysis of randomized clinical trials'[1] and welcome the opportunity to respond.

This correspondence has highlighted an important distinction on the methodology of some of the included studies. Four of the included studies trained their participants to a defined proficiency using virtual-reality training (VRT) and compared performance with participants who received no additional training (NAT)[2–5]. Individually these studies favoured VRT, which would likely be confirmed by meta-analysis. We acknowledge that inclusion of train-to-proficiency model subgroup analysis could be beneficial in demonstrating a positive relationship between VRT and performance and should be considered for future work. Of the three studies identified in the correspondence, two justified the training duration with previous evidence, but it is reasonable to question whether sufficient time was available for all participants to all achieve a defined level of competence, particularly with mixed-ability participants. Most available and included studies use the train-to-time model, which is likely a reflection of the training delivered of the time. With the implementation of the new competency-based general surgery curriculum in the UK and Ireland, it is likely that the train-to-proficiency model methodology and barriers to the implementation of simulation training will be more widely reflected in academic research.

Ideally, all participants would have comparable baseline characteristics and proficiency before intervention. Meta-analysis of studies with heterogenous participants (such as medical students *versus* surgical trainees) can influence results. This can also serve to reflect the heterogenous levels of skills, experience, and learning curves of those in a cohort of junior trainees, which should be considered in the interpretation of results.

References

1. Humm G, Mohan H, Fleming C, Harries R, Wood C, Dawas K *et al.* The impact of virtual reality simulation training on operative performance in laparoscopic cholecystectomy: meta-analysis of randomized clinical trials. *BJS open* 2022;**6**:zrac086
2. Aggarwal R, Ward J, Balasundaram I, Sains P, Athanasiou T, Darzi A. Proving the effectiveness of virtual reality simulation for training in laparoscopic surgery. *Ann Surg* 2007;**246**:771–779
3. Ahlberg G, Enochsson L, Gallagher AG, Hedman L, Hogman C, McClusky DA *et al.* Proficiency-based virtual reality training significantly reduces the error rate for residents during their first 10 laparoscopic cholecystectomies. *Am J Surg* 2007;**193**: 797–804
4. Palter VN, Orzech N, Reznick RK, Grantcharov TP. Validation of a structured training and assessment curriculum for technical skill acquisition in minimally invasive surgery: a randomized controlled trial. *Ann Surg* 2013;**257**:224–230
5. Våpenstad C, Hofstad EF, Bø LE, Kuhry E, Johnsen G, Mårvik R *et al.* Lack of transfer of skills after virtual reality simulator training with haptic feedback. *Minim Invasive Ther Allied Technol* 2017;**26**:346–354