# MP34-10



# The utility of mixed reality model projection in ultrasound training for medical students

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## (Backgrounds)

Mixed reality (MR) is a novel tool that is expected to assist medical imaging. A wearable MR device allows its wearer to view holographic 3-dimensional (3D) models projected in the real world. This can assist the wearers in linking their anatomical knowledge with a real human body, which is vital when conducting ultrasound (US) examinations., and the major Benefit from this assistance would be less difficulty in US practice. Thus, MR technology could lead to more efficient US training, especially in beginners. We analyzed the utility of holographic 3D abdominal organ model projection using a MR device for medical

students receiving renal US training.

# (Hypothesis)

Holographic 3D organ model projection from a wearable MR computer facilitates US training of the beginners by;

- assisting three-dimensional understanding of anatomy immersing them into the training
- improving their self-efficacy

# (Materials & Methods)

Materials

HoloLens (Microsoft, Redmond, WA, USA)

An optical see-through head-mounted display equipped with a pair of MR smartglasses. The wearer can view a 3D model displayed in the MR smartglasses as a holographic image overlaid onto the physical environment.

HoloEyesXR (Holoeyes, Inc., Tokyo, Japan)

A 3D image displaying software operates on the HoloLens. We used this software to superimpose MR model onto the US subject's body.

Subjects

The 4<sup>th</sup> grade undergraduate students in Tokyo medical and Dental University with no prior US training experience.

### Methods

The participants were divided into two groups according to lottery by PC. Then they underwent US training following the order below.

	Group A (conventional training first)	Group B (MR-assisted training first
1.	Take a lecture using slides and tex necessary knowledge to conduct	xtbook. The content was t renal US.
2.	Undergo 9 minutes renal US training following the same protocol as Group A but without the HoloLens. (Conventional training)	Undergo 9 minutes renal training superimposing a abdominal organ model o the US subject's body by HoloLens (MR-assisted tra
3.	Fill in the questionnaire asking self evaluations of the previous training and take a 10 minutes break.	
4.	Undergo 9 minutes MR-assisted training.	Undergo 9 minutes Conventional training.
5.	Fill in the questionnaire asking evaluation of both Convent and MR-assisted training.	
The cone r	questionnaire consisted of eight 0-2 multiple choice question.	10 Likert scale questions a

### The difficulty to acquire ultrasound (US) proficiency

from getting skilled;

Insufficient skill/knowledge

In order to get rid of this cycle, the trainee's self-efficacy has to be improved.

US 3D on to the raining) ious ional

Figure 1: MR-assisted training

A renal ultrasound training participant wearing the HoloLens and looking at the 3-dimensional organ model superimposed on to the subject's abdomen.



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## Conclusion

3D organ model projection by MR device improves subjective achievement and satisfaction level of the renal ultrasound training, and also lessens difficulty of the training in medical students. Furthermore, MR-assisted training, compared to conventional one, makes student trainees' self-efficacy level higher, which may result in rapid proficiency of their ultrasound skills.





### This study was approved by the institutional review board (M2018-086).

MR is a type of technology that enables to project 3D models as if they exist in real space. The 3D model can be manipulated through the device and you can move it or anchor it to a particular coordinate.

Recently, MR's ability to assist three-dimensional understanding and provide immersive experience has been applied to medical field, mostly in surgery.



oup A (n=7)	Group B (n=8)
21 (21-22)	21 (21-23)
: 7, Female: 0	Male: 5, Female: 3