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Competency assessment for gastric endoscopic submucosal dissection using an endoscopic part-task training box

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Abstract

Background Objective assessment of endoscopist competency is important. Recently, the endoscopic part-task training box (Thompson Endoscopic Skills Trainer [TEST]) was developed to assess endoscopist competency. We aimed to evaluate the ability of the TEST to assess competency during endoscopic procedures, especially endoscopic submucosal dissection (ESD).

Methods Twenty-three physicians were included in this study. Correlations between TEST scores and the following factors were evaluated: years of endoscopic experience, number of esophagogastroduodenoscopies (EGDs) performed, number of colonoscopies (CSs) performed, cecal intubation rate, number of gastric ESDs performed, gastric ESD procedure time/lesion size (min/mm^2), and gastric ESD self-completion rate. Also, correlation coefficients between the number of gastric ESDs performed and each of gastric ESD procedure time/lesion size and gastric ESD self-completion rate were calculated.

Results TEST scores showed strong correlations to different factors: years of experience in endoscopy: 0.957 ($p < 0.01$); number of EGDs: 0.947 ($p < 0.01$); number of CSs: 0.947, ($p < 0.01$); number of gastric ESDs: 0.924 ($p < 0.01$); gastric ESD procedure time/lesion size: − 0.9 ($p < 0.01$); self-completion rate of gastric ESDs: 0.857 ($p < 0.005$). The number of gastric ESDs performed was not more strongly correlated to procedure time of gastric ESDs or self-completion rate of gastric ESDs compared to TEST scores (− 0.824 ($p < 0.01$) and 0.704 ($p < 0.05$), respectively). TEST scores of endoscopists with a cecal intubation rate ≥ 90% were > 380, while the scores of physicians with a gastric ESD self-completion rate ≥ 90% were > 700.

Conclusions TEST score correlates with both basic and advanced endoscopic procedures. TEST is therefore a promising option for assessing endoscopist competency, and might be useful for providing threshold scores as competency markers for specific endoscopic procedures such as gastric ESD.

Keywords Training · Endoscopy · Thompson Endoscopic Skills Trainer · Competency · Endoscopic submucosal dissection (ESD)

An important concern in the education of endoscopists is how to properly assess competency. Previously, the most common educational method was master-apprentice style training. Since then, thresholds for the numbers of endoscopic procedures that must be performed before competency can be assessed were defined by the American Society for Gastrointestinal Endoscopy [1]. However, several articles have suggested that the proposed thresholds are not high enough to evaluate competency correctly [2–4]. Thus, a reliable method of objectively and individually assessing competency is a current field of enquiry [5, 6]. Recently, a computerized virtual reality endoscopic simulator has been integrated into the board certification exam for general surgery in the United States of America [7–9]. Computerized virtual reality simulators are effective tools for objectively assessing endoscopic skill. However, the introduction cost is high [10]. More recently, an endoscopic part-task training box (Thompson Endoscopic Skills Trainer (TEST), ENDOSIM, MA, USA) was developed based on kinematic motion analysis. TEST allows endoscopists to be scored according to their ability to perform the basic techniques required for performing endoscopy [11, 12] (Fig. 1).

In the past, several articles about education programs for gastric endoscopic submucosal dissections (ESDs) were published, and threshold numbers were proposed for performing gastric ESDs [13–15]. However, as with endoscopy

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Fig. 1 Endoscopic part-task training box (TEST; Thompson Endoscopic Skills Trainer, ENDOSIM, MA, USA)

in general, no objective method of assessing the competency of endoscopists to perform ESD has been established.

With the above in mind, the aim of this study was to evaluate the correlations between TEST scores and a number of factors [years of experience in endoscopy, number of esophagogastroduodenoscopies (EGDs) performed, number of colonoscopies (CSs) performed, number of gastric ESDs performed, procedure time of gastric ESDs/size of the lesion, and self-completion rate of gastric ESDs] considered important for endoscopy in order to assess the ability of the TEST to assess ESD competency.

Methods

A total of 23 physicians (10 attending physicians and 13 fellows) were included in this study. They were scored using the TEST between October 15, 2015 and September 7, 2016 at the Jikei University School of Medicine using a previously reported method [11]. To evaluate the ability of the TEST to assess general endoscopic skill, correlation coefficients were calculated between TEST scores and the following factors: years of experience in endoscopy, number of EGDs performed, and number of CSs performed. We then isolated 17 physicians with experience of performing > 30 CSs, and compared TEST scores between those with a cecal intubation rate ≥ 90% and those with a rate < 90%.

To evaluate the ability of the TEST to assess gastric ESD competency, correlation coefficients between TEST scores and the following factors were calculated: number of gastric ESDs performed, procedure time of gastric ESDs/lesion size (min/mm^2), and self-completion rate of gastric ESDs in the nine physicians with experience of > 10 gastric ESDs. The medical records of the five most recent gastric ESDs performed before the assessment were used to calculate the gastric ESD procedure time/lesion size. Finally, physicians with experience of > 10 gastric ESDs were chosen, and their TEST scores were compared between those with a self-completion rate ≥ 90% and those with a rate < 90%.

Table 1 Correlation coefficients between TEST scores and potential competency markers for endoscopic procedures

	Correlation coefficient (95% CI) with TEST score
Years of experience in endoscopy	0.957 (0.898–0.983)[a]
Number of EGDs performed	0.947 (0.898–0.983)[a]
Number of CSs performed	0.947 (0.874–0.978)[a]

TEST Thompson Endoscopic Skills Trainer, *EGD* esophagogastroduodenoscopy, *CS* colonoscopy, *CI* confidence interval

[a]Spearman's rank-order correlation

Statistical analysis

Statistical analysis was performed using SPSS for Windows (SPSS, release 6.0, 1993; SPSS Inc., Chicago, IL, United States). Spearman's rank-order correlation analysis was performed to calculate correlation coefficients. The Mann–Whitney *U* test was used to determine differences in TEST scores, and the data are expressed as means ± standard deviations. A *p*-value < 0.05 was considered statistically significant.

Results

The mean years of experience in endoscopy, number of EGDs performed, and number of CSs performed were 6.48 ± 5.56, 6670 ± 8340, and 2340 ± 2780, respectively. The mean TEST score of the 23 physicians was 428.8 ± 207.5. Among the 23 physicians, 14 physicians had a cecal intubation rate of ≥ 90%. TEST scores showed strong correlation to the following factors: years of experience in endoscopy: 0.957 [$p < 0.0001$, 95% confidence interval (CI); 0.898–0.983]; number of EGDs performed: 0.947 ($p < 0.0001$, 95% CI 0.898–0.983); number of CSs performed: 0.947 ($p < 0.01$, 95% CI 0.874–0.978) (Table 1).

The mean TEST score of physicians with a cecal intubation rate < 90% was 286.7 ± 25.2, while that of physicians with a rate ≥ 90% was 568.8 ± 118.4. The difference between the two groups was statistically significant ($p < 0.001$).

The mean number of gastric ESDs performed, procedure time of gastric ESDs/lesion size (min/mm^2), and self-completion rate of gastric ESD in the physicians with experience of > 10 gastric ESDs were 125 ± 195.1, 1.54 ± 1.15, and 60 ± 43.9, respectively.

The correlation coefficients between the number of gastric ESDs and each of gastric ESD procedure time/lesion size and gastric ESD self-completion rate were − 0.824 ($p < 0.001$, 95% CI − 0.963 to − 0.331) and 0.704 ($p < 0.05$, 95% CI 0.074–0.832), respectively (Table 2).

The mean TEST score of physicians with a gastric ESD self-completion rate < 90% was 520 ± 68.9, and the mean TEST score of physicians with a rate ≥ 90% was 731.3 ± 25.4. The difference between the two groups was statistically significant ($p < 0.001$).

TEST scores showed strong correlations to the number of gastric ESDs performed, gastric ESD procedure time/lesion size, and gastric ESD completion rate [0.924 ($p < 0.0005$, 95% CI 0.661–0.985), − 0.9 ($p < 0.001$, 95% CI − 0.980 to − 0.571), and 0.857 ($p < 0.005$, 95% CI 0.449–0.969)], respectively (Table 3). The number of gastric ESDs performed showed stronger correlations to neither procedure time of gastric ESDs nor self-completion rate of gastric ESDs compared to TEST scores (Figs. 2, 3, 4, 5).

TEST scores of endoscopists with a cecal intubation rate ≥ 90% were > 380, while the scores of physicians with a gastric ESD self-completion rate ≥ 90% were > 700.

Table 2 Correlation coefficients among the potential competency markers for gastric ESD

	Correlation coefficient (95% CI) with number of gastric ESDs performed
Procedure time of gastric ESDs/size of the lesion	− 0.824 (− 0.963 to − 0.331)[a]
Self-completion rate of gastric ESDs	0.704 (0.074–0.832)[a]

TEST Thompson Endoscopic Skills Trainer, *ESD* endoscopic submucosal dissection, *CI* confidence interval

[a]Spearman's rank-order correlation

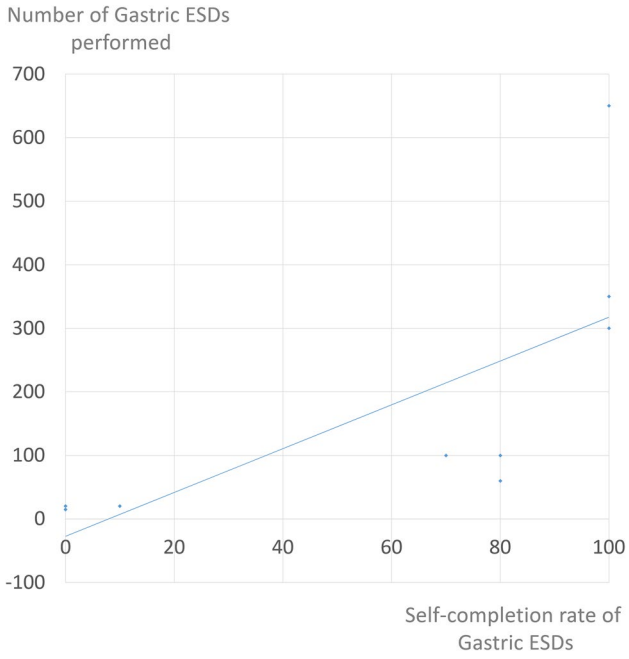

Fig. 2 Scatter graph showing the number of gastric endoscopic submucosal dissections (ESDs) performed and the self-completion rate of gastric ESDs with a regression line (correlation coefficient: 0.704)

Discussion

The results of this study revealed that TEST scores were strongly correlated with years of experience in endoscopy, number of EGDs performed, and number of CSs performed. From these results, we consider TEST scores to be a good indicator of individual skill for performing basic endoscopic procedures. Furthermore, our results suggest that TEST scores are a better competency marker for gastric ESD than the number of procedures performed.

At present, gastric ESD education is based on the number of gastric ESDs performed. However, the learning curve for this procedure differs among endoscopists. Therefore, individualized training programs should be provided by integrating objective indicators. The TEST enables endoscopists to be assessed reliably, and the scores were strongly correlated with the procedure time

Table 3 Correlation coefficients between TEST scores and potential competency markers for gastric ESD

	Correlation coefficient (95% CI) with TEST score
Number of gastric ESDs performed	0.924 (0.661–0.985)[a]
Procedure time of gastric ESDs/size of the lesion	− 0.9 (− 0.980 to − 0.571)[a]
Self-completion rate of gastric ESDs	0.857 (0.449–0.969)[a]

TEST Thompson Endoscopic Skills Trainer, *ESD* endoscopic submucosal dissection, *CI* confidence interval

[a]Spearman's rank-order correlation

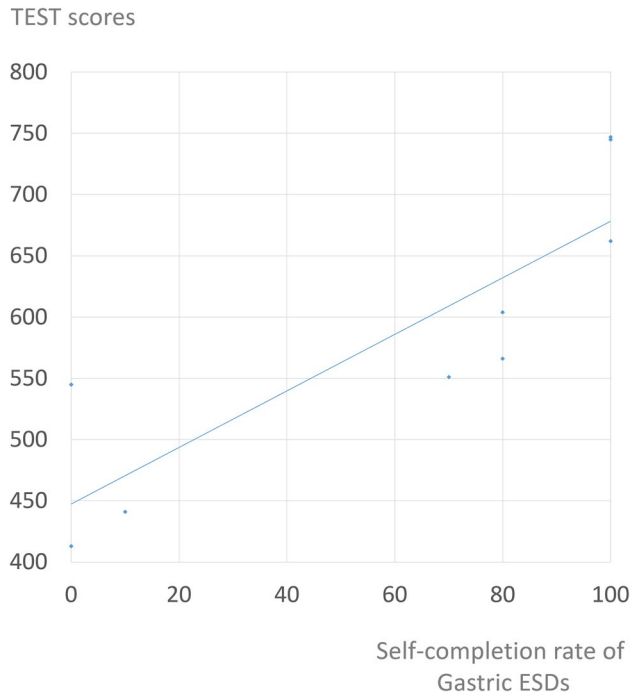

Fig. 3 Scatter graph showing Thompson Endoscopic Skills Trainer (TEST) scores and the self-completion rate of gastric endoscopic submucosal dissections (ESDs) with a regression line (correlation coefficient: −0.9)

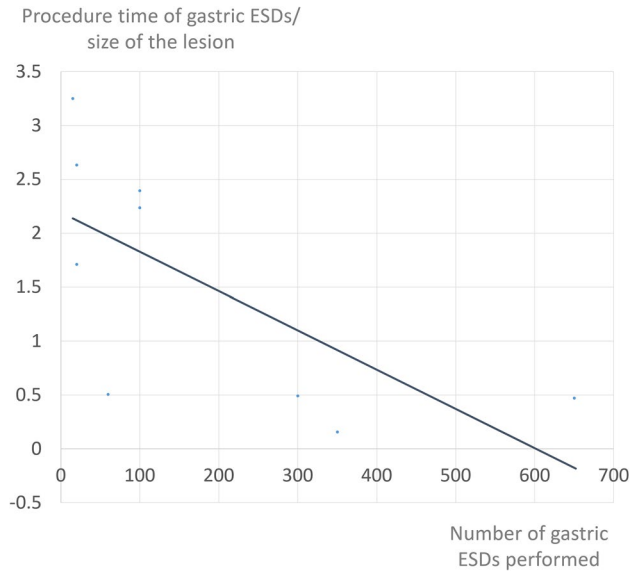

Fig. 4 Scatter graph showing the number of gastric ESDs performed and the procedure time of gastric endoscopic submucosal dissections (ESDs)/size of the lesion with a regression line (correlation coefficient: −0.824)

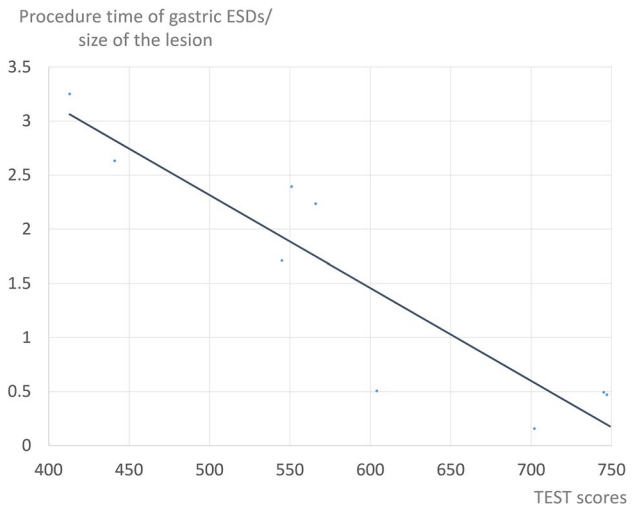

Fig. 5 Scatter graph showing Thompson Endoscopic Skills Trainer (TEST) scores and the procedure time of gastric endoscopic submucosal dissections (ESDs)/size of the lesion with a regression line (correlation coefficient: 0.857)

and self-completion rate of gastric ESDs. Individualized education could therefore be possible by utilizing TEST scores to assess individual competency.

TEST scores differed significantly between endoscopists with different gastric ESD self-completion rates (≥ 90% and < 90%). Furthermore, all of TEST scores of endoscopists with a gastric ESD self-completion rate ≥ 90% were > 700. This result suggests that TEST performs well in stratifying the competency of endoscopists for ESD. This study had one key limitation. The number of physicians included was small, and further study is therefore required to assess the ability of TEST scores to assess competency in a range of specific endoscopic settings.

In conclusion, TEST is an easy-to-apply tool for assessing endoscopist competency, and might be useful for providing threshold scores as competency markers for specific endoscopic procedures such as gastric ESD. In addition, TEST could potentially be integrated into the board certification process for gastrointestinal endoscopy in the future.

Author contributions NT: conception and design; analysis and interpretation of the data; drafting of the article. HA: conception and design; critical revision of the article for important intellectual content. MK: conception and design. KI: conception and design. KS: conception and design.

Compliance with ethical standards

Disclosures Naoto Tamai, Hiroyuki Aihara, Masayuki Kato, Kimio Isshi, and Kazuki Sumiyama have no conflicts of interest or financial ties to disclose.

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