i; Original article

ii: Social networking service messages improve novice trainees' motivation and performance of skills

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Text

Abstract

Purpose: We examined the usefulness of positive social networking service (SNS) messages to improve motivation and performance during off-the-job training.

Methods: Subjects were sixth-year medical students who completed a four-week clinical clerkship in our department involving two separate tasks. Time taken to perform the tasks was recorded on Days 1, 14 and 28. All trainees All trainees voluntarily practiced the task until Day14. The trainees were classified into two groups according to the results of their time measurements on Day14. The slow time group was intervened with SNS messages (SNS group) and the fast time group was not intervened (non SNS group; nSNS). The SNS group received messages from the moderator daily or every other day. The time to complete the skills practiced in the first (Days 1–14) and second half (Days 15–28) were recorded for each group.

Results: On Day 14, the time for both tasks of the nSNS group was significantly faster than the SNS group. However, there was no significant time difference on Day 28. During Days 15–28, the SNS group had significantly more practice days than the nSNS group (5.3 vs. 3.8 days, p=0.023). On questionnaire, all SNS group participants indicated that the messages increased their motivation to practice.

Conclusions: SNS messages using smartphones might have increased motivation for task training and

improved the performance of tasks in off-the-job training for novice trainees.

Key words: surgical skills training, performance, off-the-job training, motivation, SNS message

Introduction

Laparoscopic surgery has revolutionized the field of surgical interventions, offering advantages like reduced invasiveness and quicker patient recovery. Training novice surgeons in acquiring proficient laparoscopic skills is a critical concern, impacting patient safety and overall healthcare quality, and has traditionally been provided through on-the-job training (On-JT). Recently, the importance of off-the-job training (Off-JT) and On-JT for surgical skills training has been reported [1]. There are many reports that Off-JT using a dry box and virtual reality simulation improves skill performance [1-5]. Simulation-based training and virtual reality platforms have demonstrated success in augmenting surgical skills among trainees [6]. Additionally, the role of motivation in shaping surgical expertise has garnered attention, with studies highlighting its influence on trainees' performance, engagement, and career choices [7-8]. Incidentally, the development of smartphones has revolutionized communication in a variety of ways. Messaging applications via social networking services (SNS) have become popular tools for communication today, allowing people to connect at any location and time. While reports exist suggesting

that non-technical skills such as communication reduce errors [9] and that verbal positive feedback enhances technical skills [10]. However, despite these advancements, a critical gap in knowledge persists: the extent to which a Social Networking Service (SNS) message application can effectively enhance laparoscopic skills and motivation among novice trainees remains largely unexplored. This is particularly pertinent in the context of today's digitally connected world, where the use of SNS platforms is ubiquitous. In a field where the marriage of skill and motivation is pivotal, it remains unknown whether SNS messages can synergistically enhance both domains. Moreover, the unique aspects of this study - the study population composed of novice trainees in a diverse healthcare system, the current timeframe, the exposure to motivational messages through a digital platform, and the subsequent impact on laparoscopic skill acquisition - collectively form a novel nexus of investigation.

Therefore, the primary objective of this study is to assess the efficacy of an SNS message application in augmenting both motivation and laparoscopic surgical basic skills among novice trainees. In conducting an interventional trial, this research endeavors to uncover whether the integration of motivational messages via an SNS platform yields superior skill acquisition compared to traditional methods alone. This study not only aims to address the paucity of evidence in this domain but also holds the potential to redefine the landscape of surgical education in the digital era.

Materials and methods

This study involved sixth-year medical students from Nagasaki University School of Medicine who

completed a four-week clinical clerkship in our department. This study was reviewed and approved by clinical research review boards of our institutions (approval no. 13062424). We provided two training tasks in basic laparoscopic surgery skills. Participants performed the rubber band transfer task, where they moved six rubber bands from their original position to a single pin each using alternate right- and left-hand movements. Next, the rubber bands were returned to their original position, and the time taken was recorded (Task 1, Fig. 1a). Participants performed the dice stacking task, where they stacked four dice in the center after moving them from their original placement in each corner of a base using alternate right- and left-hand movements, and the time taken was recorded (Task 2, Fig. 1b). The time measurement for both tasks started when the forceps appeared on the screen and ended when the forceps disappeared from the screen.

On the first day of training, we gave a 30-minute briefing on the use of the dry box and forceps and provided an explanation of the task content. Each student then practiced the tasks once, and their completion times were recorded. The dry box was installed in the free access room in our department and accessible at any time. Each student practiced at their own pace and independently. The moderator did not provide any advice regarding the tasks during their practices. On Day 14, we measured the completion times for each task and divided the participants into two groups: the fast group (non-SNS group) and the slow group (SNS group). For Days 15–28, the moderator sent positive messages of motivation and support to the SNS group via LINE, a smartphone application that offers calling and messaging services,

daily or every other day. The nSNS group did not receive any messages from the moderator. The moderator did not provide any advice regarding the tasks to either group. On Day 28, final time measurements for the tasks were taken to evaluate the level of achievement (Fig. 2). To evaluate the impact of the moderator's messages, we administered a post-training questionnaire. The outline of the study was described beforehand in the questionnaire was regarded as consent. Fisher's exact test and $\chi 2$ test were used to compare the data. Numerical data were compared by Student's t-test. $P \leq 0.05$ at a 95% confidence interval was considered to be statistically significant. Statistical analyses were performed using statistical software (JMP Pro version 15). Discrete random variables are presented as percentages and continuous random variables are presented as mean and range.

The questionnaire consisted of 3 questions on a five-point Likert Scale (5 being strongly agree to 1 being strongly disagree) (Table 2).

Results

The present study included a total of 33 participants; 17 in the nSNS group (11 males and 6 females) and 16 (11 males and 5 females) in the SNS group. Median age of the participants was 25.1 [23.2-30.5] years for the nSNS group and 24.4 [23.1-28.6] years for the SNS group, and the difference was not significant. Most of the entire cohort was right-handed, with 88% in the nSNS group and 94% in the SNS group. Furthermore, there was no significant difference in the level of interest in surgery between the two groups.

The nSNS group performed significantly faster than the SNS group in both tasks 1 and 2 during the initial phase of the study (task 1: nSNS 110.0 s vs SNS 152.6 s, p=0.00015; task 2: nSNS 69.3 s vs SNS 121.9 s, p=0.0046) (**Table 1**). By Day 14, the nSNS group's performance was still significantly faster than the SNS group in both tasks (task 1: nSNS 66.2 s vs SNS 94.4 s, p=0.0036; task 2: nSNS 41.8 s vs SNS 83.3 s, p=0.029). However, by Day 28, there was no significant difference in the performance of the two groups (task 1: nSNS 62.1 s vs SNS 60.3 s, p=0.77; task 2: nSNS 41.2 s vs SNS 40.8 s, p=0.96) (**Figs. 3,4**).

For Days 1–14, there was no significant difference in the number of practice days between the groups (nSNS 2.8 days vs SNS 2.6 days, p=0.43). However, for Days 15–28, the SNS group had significantly more practice days than the nSNS group (nSNS 3.8 days vs SNS 5.3 days, p=0.023). (**Fig. 5**)

All members of the SNS group received 6 positive messages during this period (Table 3). The messages provided to the trainee solely consist of praise for their practice and do not include any technical advice. All 16 (100%) members reported that the moderator's messages were relevant (4.88 points), motivating (4.81 points), and effective (4.75 points) (**Fig. 6**).

Discussion

Simulation training is now an integral part of surgical training. For endoscopic surgery in particular, training with dry box simulators such as in the Fundamentals of Laparoscopic Surgery training [4] (a

required course by the American College of Surgeons), virtual reality simulators, and disease-specific simulators such as the transformational advanced professional practice model [2] and the hepaticojejunostomy model [3] are reportedly useful. On the other hand, Chang [11] reported that skill training dependent on resident's intrinsic motivation is ineffective, and that participation in training is low even though residents themselves feel that skill training improved their intraoperative performance. They further stated that the reasons for this are lack of interest, time and off-site rotations, making it difficult to maintain motivation to do training by voluntarism alone. In contrast, Stefanidis [12] states that mandatory curricula have inherent limitations and that special resources, personnel, and dedicated time slots for training are key elements that are difficult to implement even when available. In other words, the key is how to keep surgical trainees intrinsically motivated while emphasizing that the goal of training is to improve their own performance.

In fact, Peturcci [13] reported that sending positive messages to trainees using a web-based messaging application effectively motivated them to practice and improved their performance. However, they noted that trainees only logged into the application once a week, indicating that accessibility was an issue for the recipients.

In our study, we used a SNS application installed on the trainees' smartphones to send and receive messages. We found a significant difference in performance between the two groups for both tasks during the first half of the entire study period, but not during the second. This suggests that the SNS group had

significantly more days of practice in the second half, which improved their performance. Based on the survey results, we believe that increased motivation from the SNS messages contributed to the increase in practice days. However, our study only measured the number of days those trainees practiced, so evaluating whether the specific duration of practice time increased before or after receiving the messages was not possible. To evaluate this, using logbooks or some other means would have been necessary. In addition, some participants reported that being placed in the slow group had an effect on their motivation. Therefore, it is difficult to determine whether the SNS messages alone contributed to increase in motivation. This study might have been better to divide into three groups: the fast group, the slow group with SNS (SNS group) and without SNS (nSNS group). Since this study was conducted over a short period of time and only during on-site rotation, it is unclear whether regular messaging can maintain motivation to practice for longer periods and during off-site rotation. Though the best method to motivate trainees to practice independently is still unclear, the results suggest that SNS messages using smartphones are simple and convenient. It may be a useful motivation tool.

Acknowledgments and disclosure:

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We have no potential competing interest (financial or personal) to disclose.

Conflict of interest statement

Keitaro Matsumoto and Takeshi Nagayasu are the Editorial Board members of ASES Journal and the co-authors of this article. To minimize bias, they were excluded from all editorial decision-making related to the acceptance of this article for publication.

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Table 1 Participant characteristics

	nSNS (n=17)	SNS (n=16)	*p* value
Sex (Male : Female)	11 : 6	11 : 5	0.406
Age [Range] (year)	25.1 [23.2-30.5]	24.4 [23.1-28.6]	0.198
Dominant hand (Right : Left)	15 : 2	15 : 1	0.296
Interested in surgery	16 (94%)	13 (81%)	0.079
Task1 time day1 (seconds)	110.0 [84-128]	152.6 [107-225]	0.00015
Task2 time day1	69.3 [22-85]	121.9 [48-297]	0.0046

Table 2 Questionnaire content for SNS group

	strongly agree (5)	agree (4)	neutral (3)	disagree (2)	strongly disagree (1)
Were the moderator's messages appropriate?					
Did the moderator's messages motivate you?					
Were SNS messages effective in motivating you to practice?					

Table 3 All SNS messages (6 messages)

I saw you practicing. You were practicing very hard.
I watched your training from behind, and the movement of the forceps was smooth.
You were practicing hard until late.
Let's do our best for another day!
It is also important to relax and not over-practice.
Tomorrow is the last day to measure the time. Please do your best!

Fig 1 Tasks 1 and 2

(a) Task 1: rubber band transfer. Six rubber bands were transferred from their original position to each pin with forceps then returned to their original positions

(b) Task 2: dice stacking. Four dice were stacked with forceps in the center of the base.

Fig 2 CONSORT statement flow diagram

Thirty-three medical students participated in this study. On Day 14, we measured the completion times for each task and divided the participants into two groups: the fast group (non-SNS group) and the slow group (SNS group).

Fig 3 Time for task 1 completion

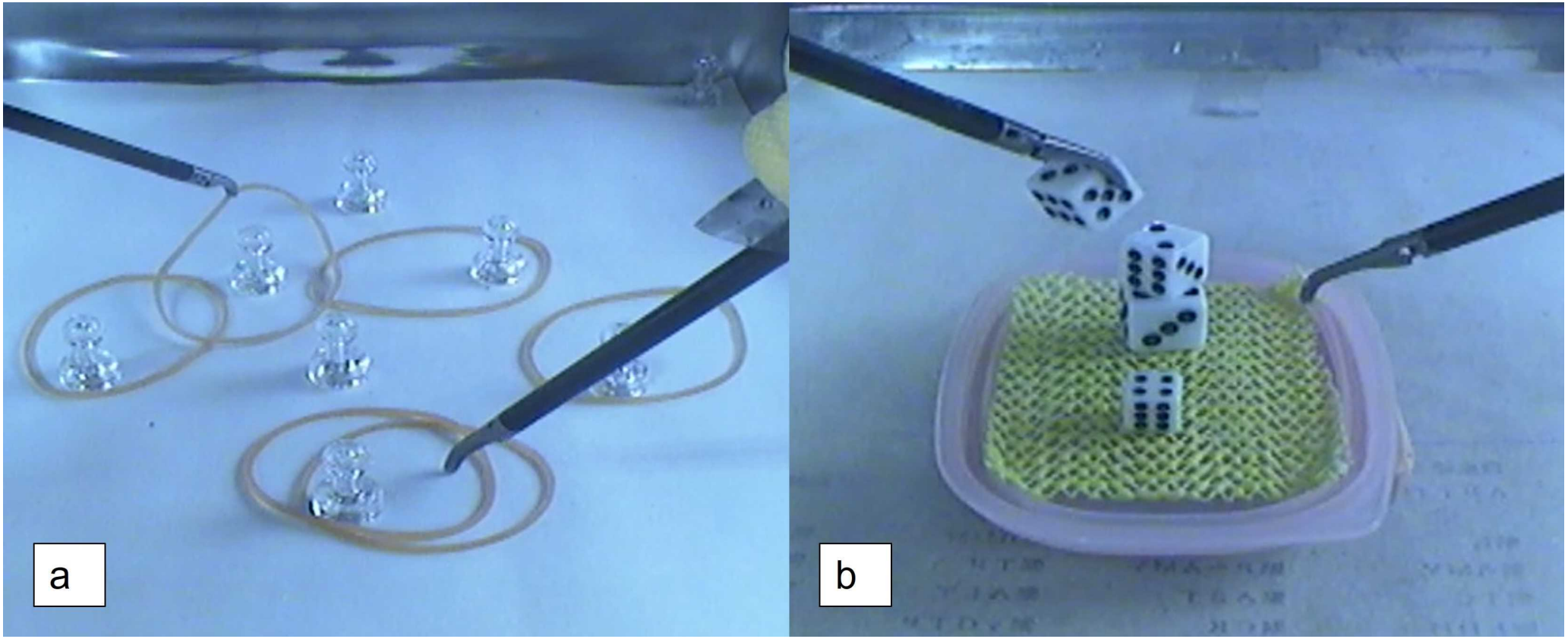
No significant difference found in performance of the two groups by Day 28

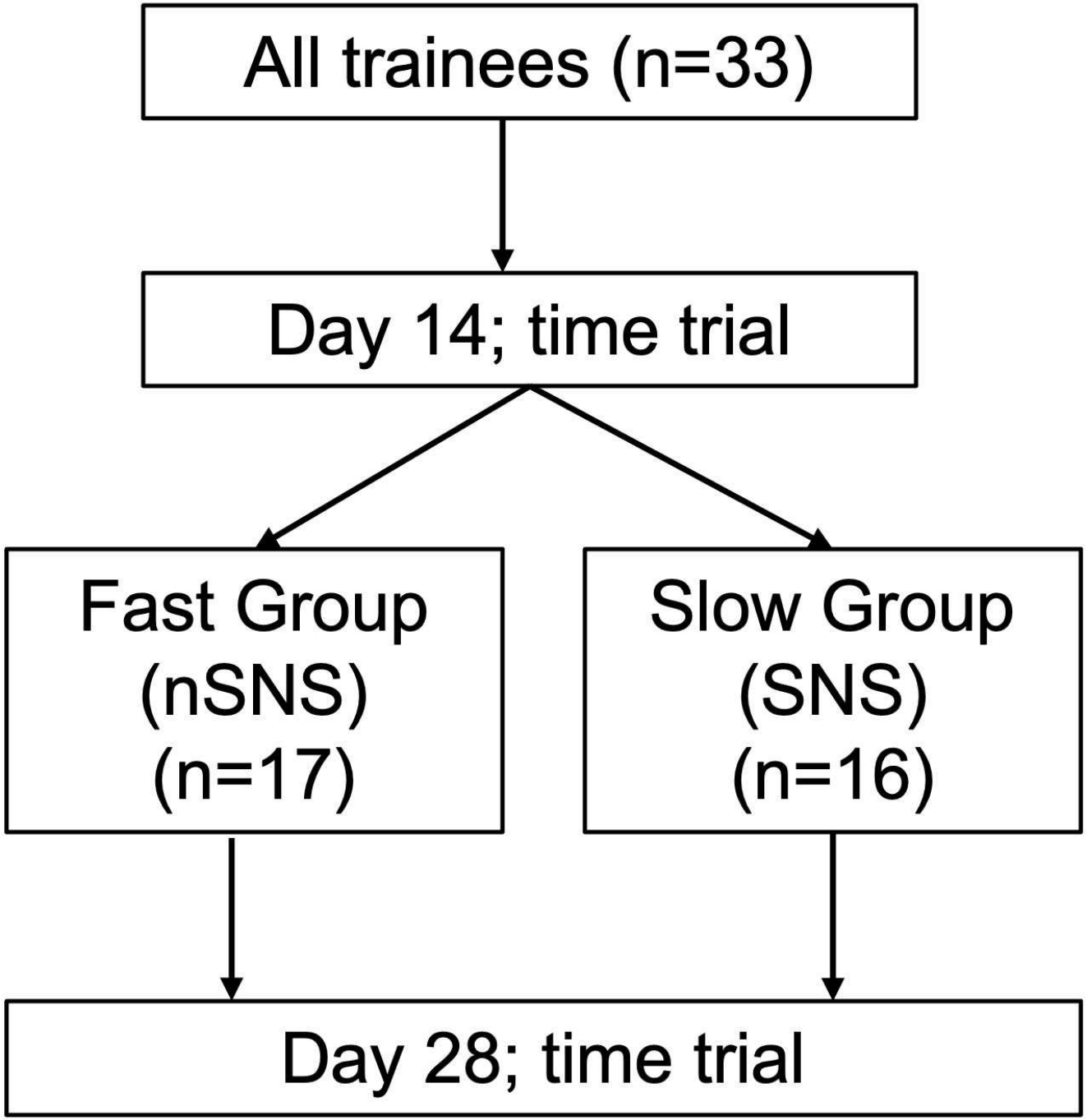
Fig 4 Time for task 2 completion

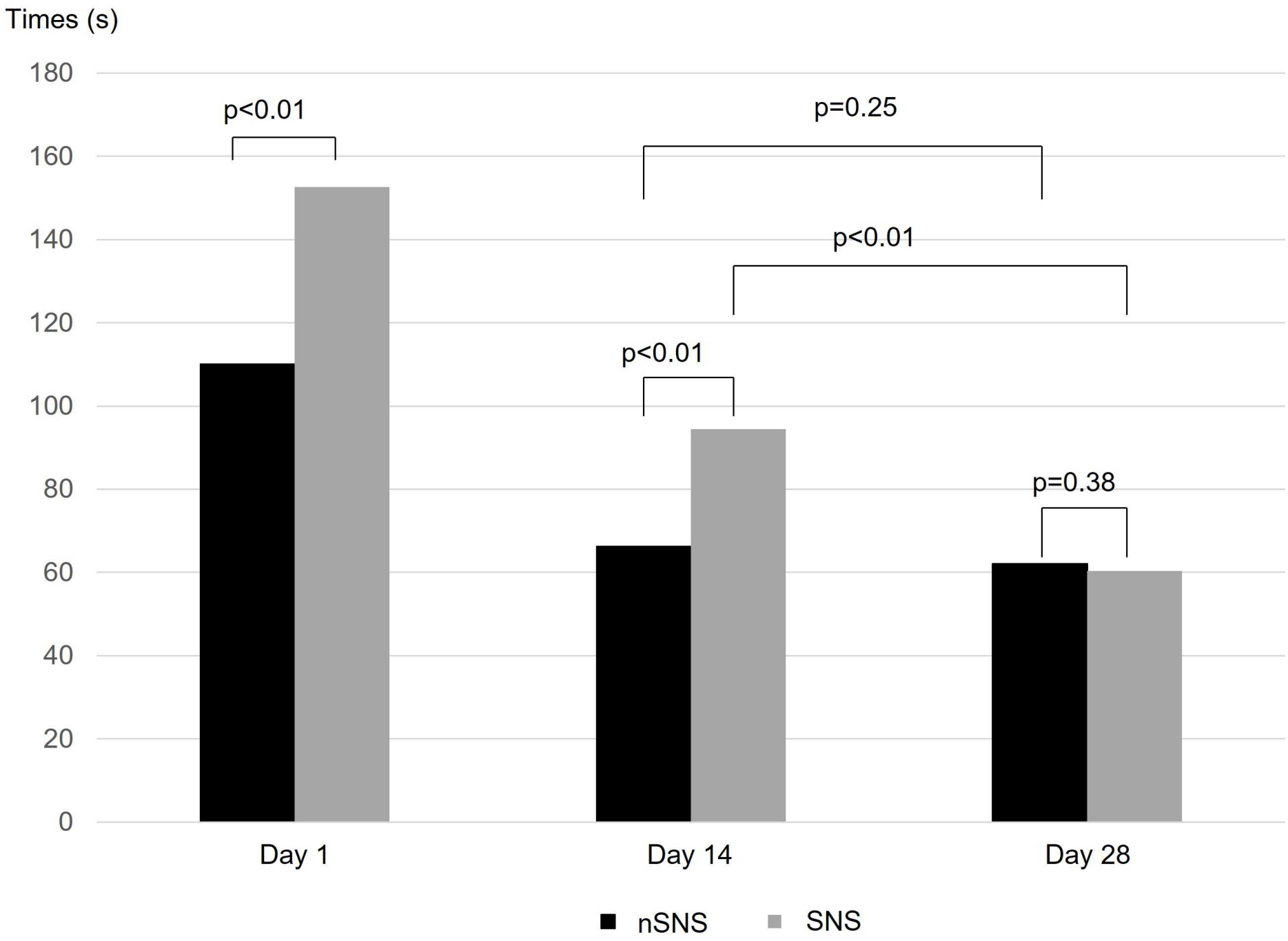
No significant difference found in performance of the two groups by Day 28

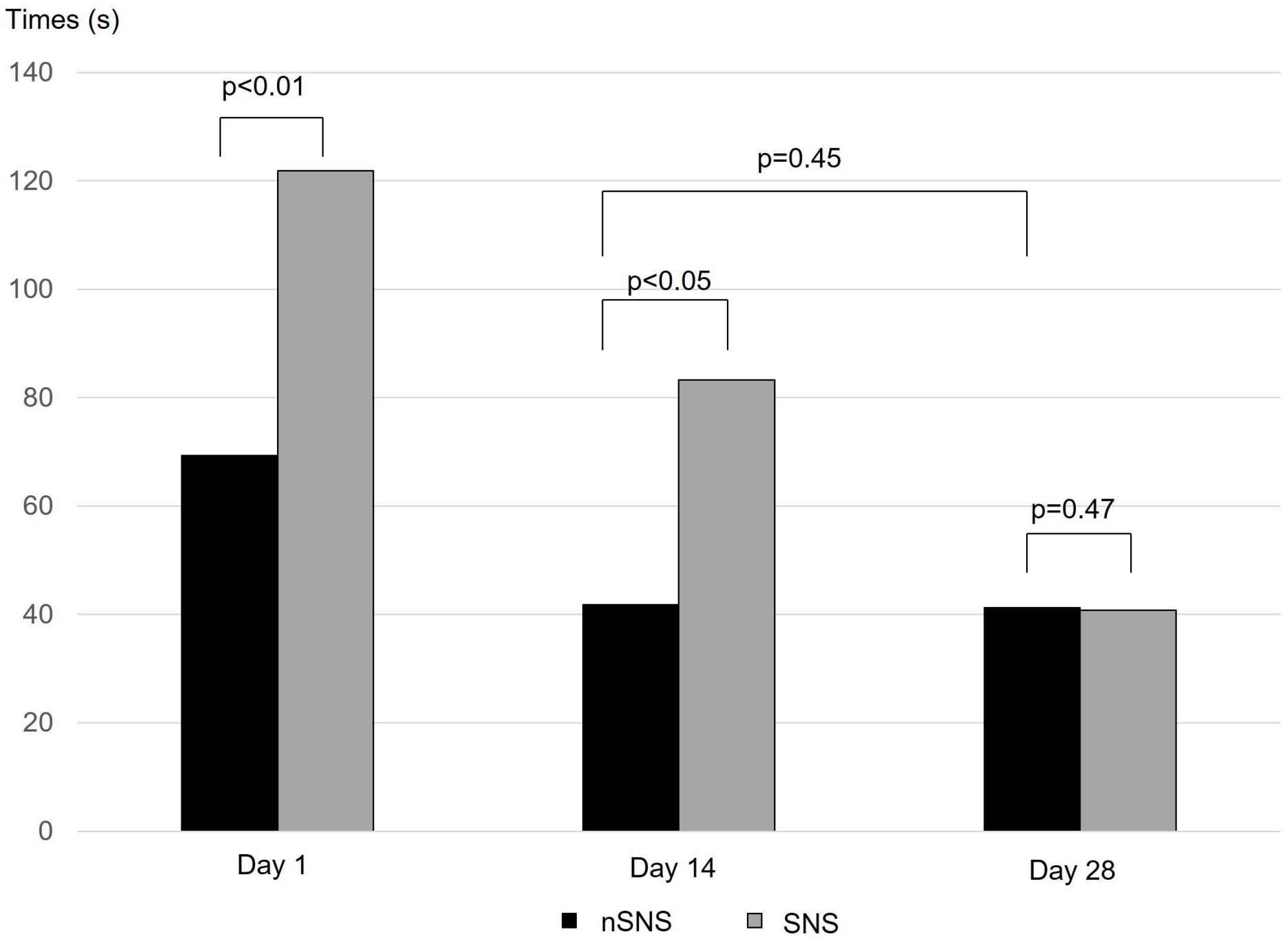
Fig 5 The SNS group had significantly more practice days than the nSNS group by Day 28

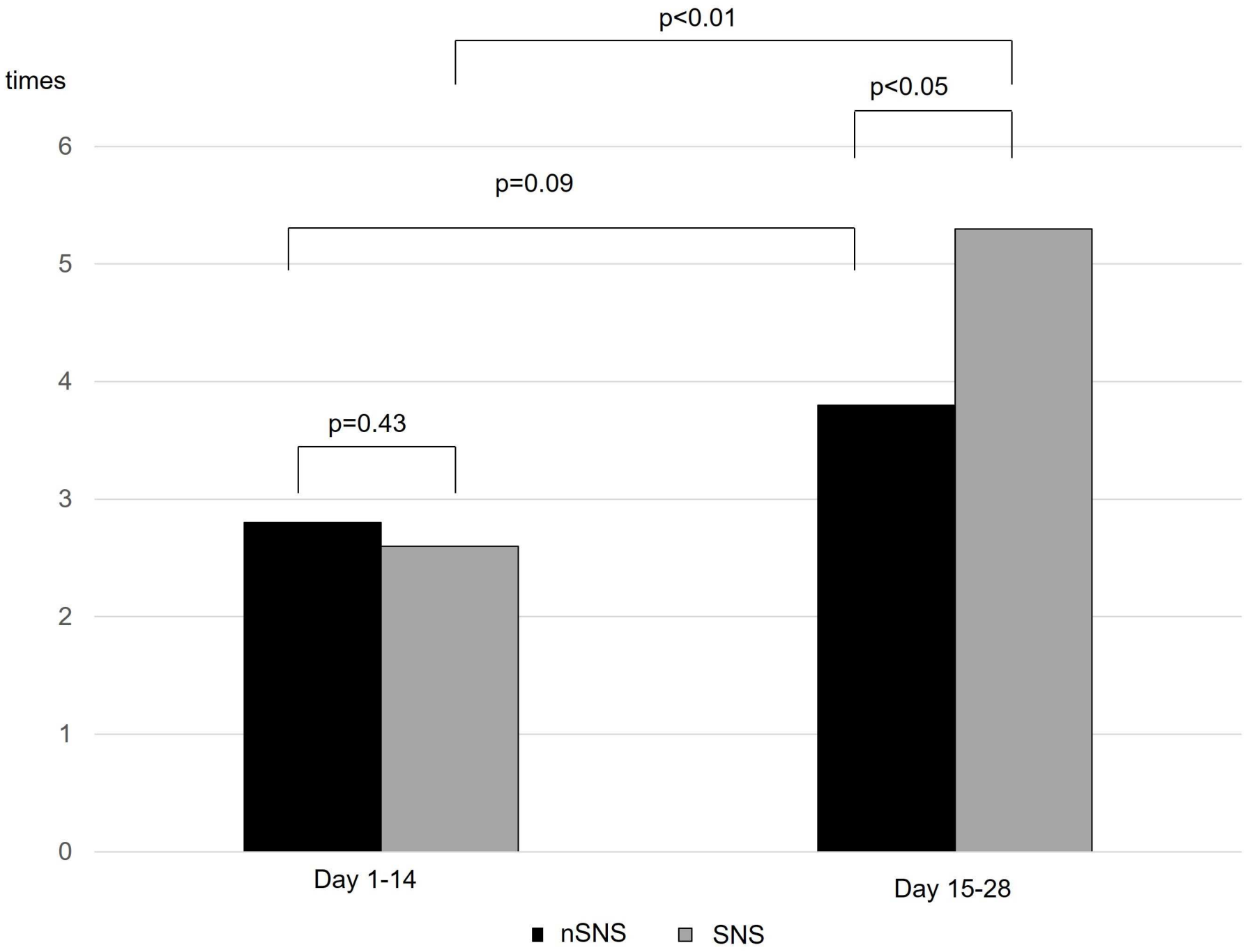
Fig 6 All SNS group participants reported that the moderator's messages were effective, motivated and relevant.

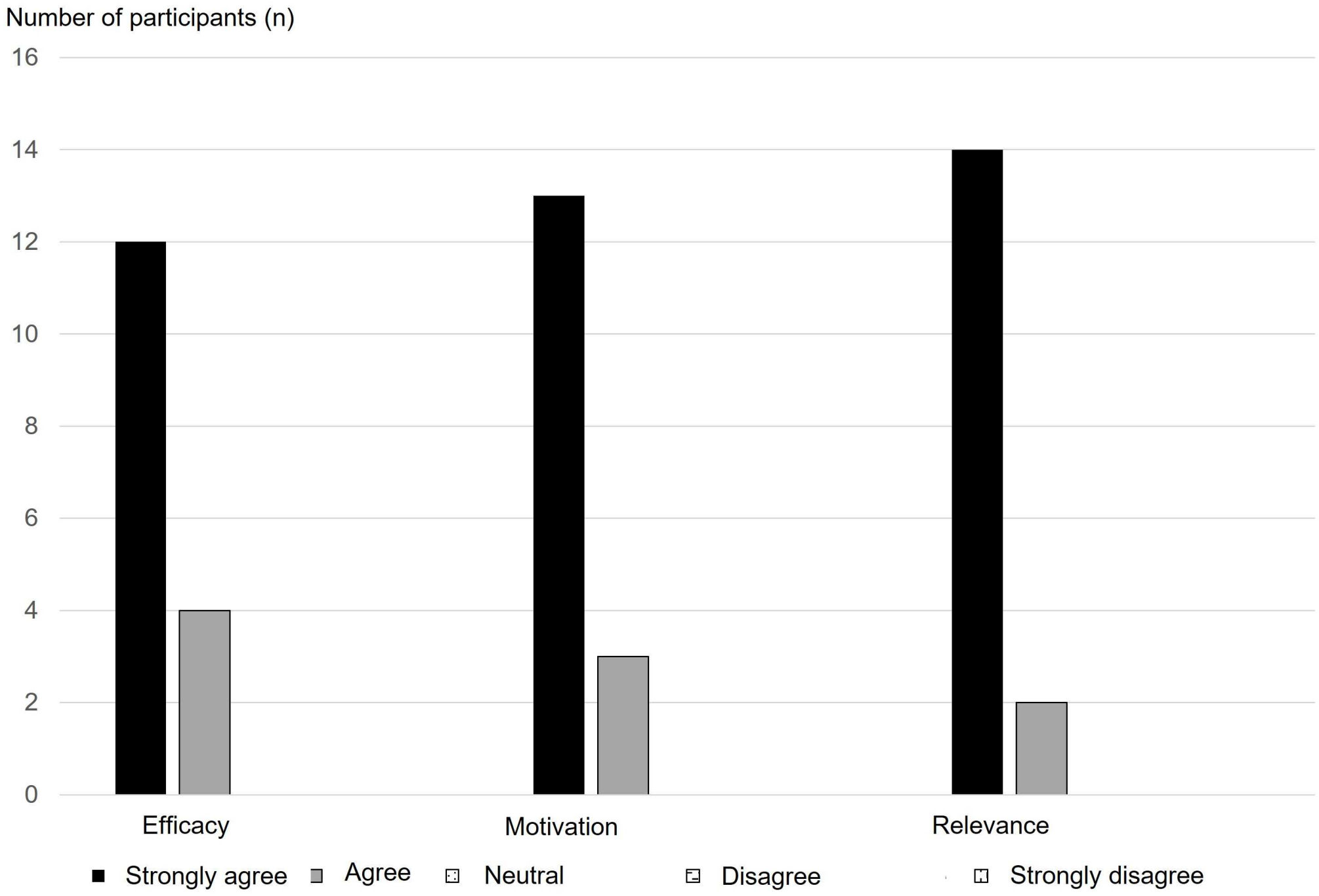

a
b


All trainees (n=33)
Day 14; time trial
Fast Group
(nSNS)
(n=17)
Slow Group
(SNS)
(n=16)
Day 28; time trial


Times (s)
180
160
140
120
100
80
60
40
20
0
p<0.01
p=0.25
p<0.01
p<0.01
p=0.38
Day 1
Day 14
Day 28
nSNS
SNS


Times (s)
140
120
100
80
60
40
20
0
p<0.01
p=0.45
p<0.05
p=0.47
Day 1
Day 14
Day 28
nSNS
SNS


p<0.01
times
p<0.05
6
p=0.09
5
4
p=0.43
3
2
1
0
Day 1-14
Day 15-28
nSNS
SNS


Number of participants (n)
16
14
12
10
8
6
4
2
0
Efficacy
Motivation
Relevance
Strongly agree
Agree
Neutral
Disagree
Strongly disagree

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