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Effect of an educational video about ERAS on reducing preoperative anxiety and promoting recovery

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ABSTRACT

Video propaganda is reported effectively improving patients' understanding of operation. However, whether a video introducing patients' most concerns can reduce preoperative anxiety and promote recovery stays unsealed. In this study, we investigated the effects of complementary therapy of educational video during preoperative visit. The results showed that thirty-five (23.2%) parents in Group Control were diagnosed as anxiety according to SAS, and nineteen (12.3%) patients were diagnosed after video intervention. The APAIs anxiety score and APAIs information score in Group Video were lower than those in Group Control. Compared with Group Control, video visit helped to increase the first-attempt pass rate of the knowledge retention exam and solve the patient's most worried concerns, and decrease incidence of emergence agitation, total cost of hospitalization and length of hospital stay. Moreover, video visit improved satisfaction degrees of patients and their main family members. Briefly, our study demonstrated video visit can improve patients' knowledge of anesthesia and decrease their preoperative anxiety, which may represent an important complementary therapy to routine preoperative visits.

1. Introduction

Preoperative anxiety, as an unpleasant state of uneasiness or tension that is secondary to a patient being concerned about a disease, hospitalization, anesthesia and surgery, or the unknown [1], has been reported to be one of the main burdensome experiences related to surgical procedure [2]. The incidence of it ranges from 11% to 80% in different populations and surgical types [3]. A recent multi-center observational study in China suggested that nearly 26% of the preoperative patients had high anxiety [4], which significantly affected the anesthesia management and patients' outcomes [5], increasing perioperative hypertension, tachycardia and arrhythmia [6], and causing postoperative pain [7], nausea and vomiting [8], emergence delirium [9] *etc*. Severe anxiety in rare circumstances can even be an independent risk factor for postoperative mortality [10,11]. As a result, anaesthetists have been taking various positive measures to reduce or eliminate preoperative anxiety, including the enhanced recovery after surgery (ERAS) strategy.

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Fig. 1. Representative video screenshots

A. Title: Preoperative Anesthesia Education; B. It's scary to mention surgery; C. Anesthesia is mysterious; D. Preoperative fasting E. What to do with the habit of smoking and drinking? F. Precautions before anesthesia; G.Don't panic and avoid emergence agitation; H. The doctors and nurses will be always there to watch over you I. Steady, smooth, safe and happy.

In the first study investigating strategy to reduce preoperative anxiety, it was found that patients who were visited by an anesthesiologist and informed about surgery and anesthesia were calmer than those premeditated with pentobarbital, who were drowsy but not calm [12]. Publicity and education during preoperative visit delivered by anaesthetists has been reported to reduce anxiety [13,14]. Besides regular narrative, many nonpharmacological interventions of delivering information about the operation and anesthesia have been successfully used to decrease the patients' preoperative anxiety, including video [15,16] and 2D cartoons [17], interactive video games [18], virtual and augmented reality education [19], and music therapy [20]. However, very few videos or music were set specifically to solve the patients' most significant concern about anesthesia. Moreover, most studies were heterogeneous with relatively small sample sizes and different populations, and the scale and time to measure preoperative anxiety also varied in different studies and whether these interventions promote patients' recovery remains controversial [21].

To further insight into the most significant causes of preoperative anxiety in China, we once conducted a survey (enrolled 305 patients) to classify the factors of preoperative concern (Figure A1). It was shown that the most significant concerns about anesthesia in surgical patients included anesthesia safety (49.5%), postoperative pain (42.6%) and anesthesia costs (42.6%). Based on the results we transformed the anesthesia precautions and ERAS principles into an educational song and made a vivid cartoon video **(Video A1)** [22]. In the study, we aimed to conduct a randomized controlled trial to explore whether the application of our educational video about anesthesia and ERAS could help to improve the quality of preoperative visit, reduce preoperative anxiety and enhance the patients' recovery after surgery in China.

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e20536

2. Methods

2.1. Study design

This single-blinded, randomized and parallel-controlled trial was conducted in line with the CONSORT statement and approved by the institutional review board of the Third Affiliated Hospital of Sun Yat-Sen University ([2019]02-357-01) and registered at Chinese Clinical Trial Registry on July 6th, 2019 (ChiCTR1900024355).

Patients undergoing elective surgery under general anesthesia in the hospital between August 2019 and June 2020 were recruited in the study. The procedures were conducted in accordance with the Helsinki Declaration-2013.

Inclusion criteria included age between 18 and 65 years; ASA I/II; with normal vision, intelligence and verbal communication and written informed consent for study participation. Patients who met any of the following criteria were excluded: whose operation was cancelled for more than 3 times for any reason, had already watched the music video, combined with severe mental disorders, had taken psychotropic drugs before surgery, had been participating in other studies, had undergone surgery within six months. Patients who were transferred to ICU after surgery and those who failed to follow up were excluded from the final analysis.

2.2. Video creation

Our team produced a 220-s music video in Chinese exclusively for this study. The music video shows the patients' most significant concerns about anesthesia, combining the principle of ERAS and constructive suggestions on the cooperation between doctors and patients. The video use light music, rhyming lyrics and two-dimensional (2D) animation (cartoon) to transmit information to and to enhance recall in patients **(**Fig. 1**A-I)**. The music was composed by Qilin Chen. The lyrics are written by Shaoli Zhou and Chaojin Chen.

2.3. Group allocation

Using a computer-generated random number table, patients were randomly assigned in a 1:1 allocation ratio to the video-visit group (Group Video) and routine preoperative visit group (Group Control). Group allocation details were stored in numbered, sealed and opaque envelopes. To maintain blinding, the anesthetist who performed the preoperative visit was not involved in management or assessments. The researchers and anesthesiologists were unaware of the patients' group allocations.

2.4. Study procedure

An independent researcher obtained the baseline anxiety score from both groups on admission by questionnaires using the SAS self-rating anxiety scale and the APAIS assessment scale on the day of admission and the day of surgery. The standard preoperative visits were conducted by a group of expert anesthetists the day before the surgery. All the patients were asked to finish knowledge retention questionnaires before the visit.

To ensure the quality of patient management in the control group, standard preoperative visit was conducted by a group of experienced anesthetists and mainly consisted of two parts. Firstly, anesthetists collected the medical history and delivered physical examination. Secondly, preoperative education was given and written informed consent was obtained. During preoperative visit on the day before the surgery, the anesthetists went to the ward, found the patient, introduced the anesthesia procedure and suggestions verbally to patients in Group Control, and the patients in Group Video watched the short music video on a mobile phone in the surgical ward. After the visiting, patients from Group Video and Group Control were asked to finish the same knowledge retention questionnaires. Notably, the patients were asked to answer all the questions correctly and if the test was not up to standard, the anesthetists would repeat the explanation of the wrong content until the test is up to standard. The time from meeting the patient to the moment

when patients answered all the questions correctly was recorded as the time cost of visiting. The satisfaction degree of the patients and their family members were measured after the preoperative visit [23]. The extent to which the patient's most worried anesthesia concerns had been solved (EwacS, the extent to which the patient's most worried anesthesia concerns had been solved) was also measured, which was defined as the length in centimeters from 0 (totally unsolved) to 10 (totally solved, no other problem) on the visual analogue scale (VAS).

On the day of surgery, preoperative anxiety score was obtained from all the patients before surgery. Patients' emergence agitation, PONV, length of hospital stay, anesthesia expenses, and total hospital expenses were also recorded.

2.5. Primary and secondary outcome variables

The primary outcome of our investigation was the patient's anxiety score using a self-rating anxiety scale (SAS) [24] and the Amsterdam Preoperative Anxiety and Information Score (APAIS) [25]. Secondary outcome variables included the first-attempt success rate of knowledge retention exam, the time cost of visiting, satisfaction degree of the patients and their family members, the EwacS, incidence of patients' emergence agitation, PONV and clinical outcomes (length of hospital stay, cost of anesthesia, and total cost of hospitalization).

2.6. Sample size

On the basis of retrospective data from previous study, the overall preoperative anxiety rate in China was nearly 26% [4]. We hypothesized the music video would halve the incidence of patient's preoperative anxiety, based on our study parameters, EpiCalc 2000 specified that 143 participants were required in each group, with a power of 80%; a two-tailed *P* value of less than 0.05 was

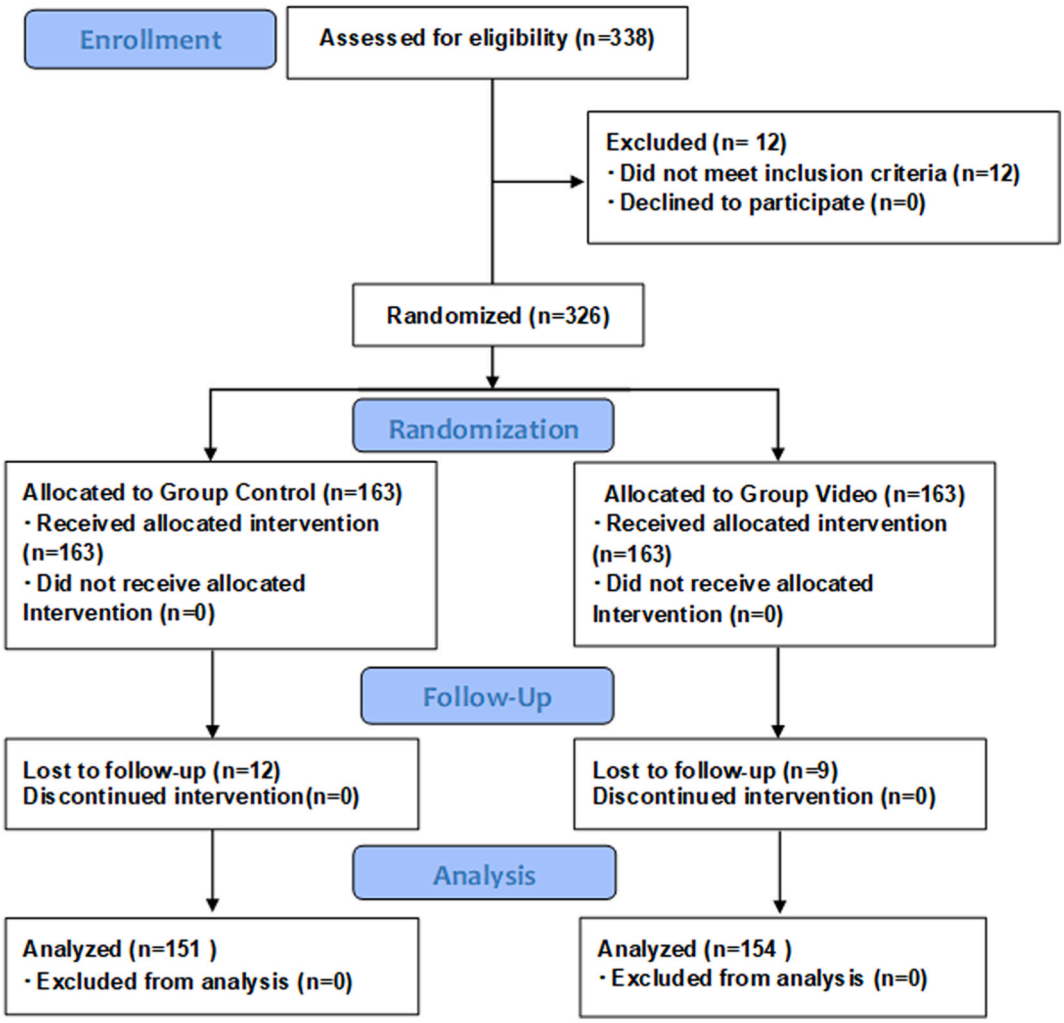

Fig. 2. Flowchart of the study.

considered indicative of statistical significance. To allow for nonadherence to the protocol, we aimed to recruit 163 patients per group in the study.

2.7. Statistical analysis

Data analysis was performed using SPSS 16.0 (SPSS, Inc., Chicago, Illinois, USA). Continuous variables like age, height and APAIs were presented as mean ± standard deviation (SD) and analyzed with the Student *t*-test. Data on SAS, satisfaction degree and cost of hospitalization and anesthesia were expressed in median (interquartile interval) and analyzed using Kruskal-Wallis test because the variables did not satisfy the criteria for normality. Qualitative/rank data like gender and ASA status were expressed as numbers (percentages) and analyzed by $\chi 2$ test or Fisher's exact test. Differences were considered significant when a two-sided *P* value was less than 0.05.

3. Results

A total of 338 patients were screened and 12 patients did not meet the entry criteria, thus, 326 patients were randomly divided into two groups. Among these, 21 patients were lost to follow-up because of the temporary changes of operating room and operative time. Therefore, data of 305 patients were included in the final analyses. The patient disposition in this study is shown in **Fig. 2**. No significant difference in age, gender, height, educational level, disease diagnosis, ASA status, religious belief and anxiety score on admission were found between the two groups. **(Table 1)**.

The baseline anxiety scores of patients on admission were not significantly different between the video and control groups, as reflected by the SAS and APAIs (both $P > 0.05$; Table 2). However, the preoperative anxiety scores were significantly lower in the music video group compared with those in the control group, as reflected by APAIs anxiety (7.24 ± 2.34 *vs.* 11.34 ± 3.01, $P = 0.014$), APAIs Information (3.95 ± 1.91 *vs.* 5.22 ± 2.77, $P = 0.031$), and SAS [28.75 (23.75,43.75) *vs.* 36.25 (27.38,55.00), $P = 0.026$]. In addition, we found that 23.2% of the patients in control group were diagnosed as anxiety according to SAS, and only 12.3% of the patients were diagnosed after music video intervention ($P = 0.047$; Table 2).

Meanwhile, we found the first-attempt pass rate of the knowledge retention exam in Group Video was much higher than that in Group Control after preoperative visit (92.2% *vs.* 80.1%, $P = 0.02$; Table 3), whereas no significant difference was found between the two groups on admission (67.5% *vs.* 63.6%, $P = 0.467$). The EwacS in Group Video was also larger than that in Group Control (9.78 ± 0.78 *vs.* 8.01 ± 1.45, $P = 0.032$). Although time cost of visiting in Group Video was a little shorter than that in Group Control, the difference was not statistically significant ($P = 0.067$). Both the satisfaction degrees of patients [8.5 (6.7,9.4) *vs.* 7.1 (5.2,8.7), $P = 0.037$] and their main family members [8.3 (6.5,9.2) *vs.* 6.9 (5.4,8.2), $P = 0.018$] in Group Video were better than that in Group Control; The patients' recovery and prognosis were also compared between the two groups. The incidence of emergence agitation in

Table 1
Preoperative baseline demographic and clinical variables.

	Group Control (n = 151)	Group Video (n = 154)	*P*-value
Gender, n (%)			0.902
Male	52 (34.4)	52 (33.8)	
Female	99 (65.6)	102 (66.2)	
Age, mean (SD), yr	39.36 ± 10.5	37.11 ± 11.56	0.760
Height, mean (SD), yr	163.58 ± 7.03	162.35 ± 7.47	0.142
ASA physical status, n (%)			0.675
I	121 (80.1)	120 (77.9)	
II	30 (19.9)	34 (22.1)	
Types of surgery	50	50	
Gastroenterology			
Urology	50	52	
Gynecology	51	52	
Disease diagnoses, n (%)			0.875
Benign disease	127 (84.1)	131 (85.1)	
Malignant disease	24 (15.9)	23 (14.9)	
Education modalities, n (%)			0.21
No	4 (2.6)	5 (3.2)	
Self-study	12 (8.0)	2 (1.3)	
Hospital	135 (89.4)	147 (95.5)	
Educational level, n (%)			0.23
Low	45 (29.8)	34 (22.1)	
Intermediate	35 (23.2)	36 (23.4)	
High	71 (47.0)	82 (53.2)	
Religious beliefs, n (%)			0.57
No	7 (4.6)	5 (3.2)	
Yes	144 (95.3)	149 (96.8)	
Preoperative sleep quality	7.01 ± 1.56	8.71 ± 1.12	**0.023**[a]

[a] *P* value of less than 0.05 was considered indicative of statistical significance.

Table 2
Primary outcome variables.

	Group Video (n = 154)	Group Control (n = 151)	*P*-value
APAIs on admission			
APAIs anxiety	13.25 ± 4.66	13.03 ± 4.14	0.657
APAIs Information	7.32 ± 2.54	7.47 ± 2.96	0.361
APAIS on the day of surgery			
APAIs anxiety	7.24 ± 2.34	11.34 ± 3.01	**0.014***
APAIs Information	3.95 ± 1.91	5.22 ± 2.77	**0.031***
SAS on admission	45.00 (34.38,60.94)	41.25 (32.50,56.25)	0.133
SAS on admission			
Normal n (%)	105 (68.2)	97 (64.2)	0.589
Light anxiety n (%)	34 (22.1)	39 (25.8)	
Moderate anxiety n (%)	8 (5.2)	11 (7.4)	
Severe anxiety n (%)	7 (4.5)	4 (2.6)	
SAS on the day of surgery	28.75 (23.75,43.75)	36.25 (27.38,55.00)	**0.026***
SAS on the day of surgery			
Normal n (%)	135 (87.7)	116 (76.8)	**0.047***
Light anxiety n (%)	16 (10.4)	30 (19.9)	
Moderate anxiety n (%)	3 (1.9)	5 (3.3)	
Severe anxiety n (%)	0 (0)	0 (0)	

**P* value of less than 0.05 was considered indicative of statistical significance.

Table 3
Secondary outcomes between the two groups.

	Group Video (n = 154)	Group Control (n = 151)	*P*-value
Knowledge retention exam			
On admission			0.467
Pass	104 (67.5)	96 (63.6)	
Not pass	50 (32.5)	55 (36.4)	
After preoperative education			**0.02***
Pass	142 (92.2)	121 (80.1)	
Not pass	12 (7.8)	30 (19.9)	
EwacS (0–10)	9.78 ± 0.78	8.01 ± 1.45	**0.032***
Time cost of visiting (s)	791 (622, 951)	802 (649, 973)	0.067
Satisfaction degree of patients	8.5 (6.7,9.4)	7.1 (5.2,8.7)	**0.037***
Satisfaction degree of patients' main family member	8.3 (6.5,9.2)	6.9 (5.4,8.2)	**0.018***
Emergence agitation			**0.044***
Yes	23 (14.9)	37 (24.5)	
No	131 (85.1)	114 (75.5)	
PONV			0.423
Yes	14 (9.1)	10 (6.6)	
No	140 (90.9)	141 (93.4)	
Total cost of hospitalization	22210.76 (14545.78,28956.25)	27054.45 (16118.77,3069.32)	**0.035***
Cost of anesthesia	2399.37 (1896.48,2865.75)	2412.49 (1907.52,2892.64)	0.331
Total length of hospital stay	5.82 (4.12,7.94)	7.17 (5.34,9.48)	**0.021***

PONV: postoperative nausea and vomiting; EwacS: the extent to which the patient's most worried anesthesia concerns had been solved; **P* value of less than 0.05 was considered indicative of statistical significance.

Group Video was significantly lower than that in Group Control (14.9% *vs.* 24.5%, $P = 0.044$), but no significant difference was found in incidence PONV between the two groups (9.1% *vs.* 6.6%, $P = 0.423$). Moreover, we found that total cost of hospitalization in Group Video was significantly less than that in Group Control [22210.76 (14545.78,28956.25) *vs.*27054.45 (16118.77,3069.32), $P = 0.035$], as well as the length of hospital stay [5.82 (4.12,7.94) *vs.* 7.17 (5.34,9.48), $P = 0.021$].

4. Discussion

Although preoperative visit has been applied for more two decades [26,27] , nearly a quarter of the patients still have severe preoperative anxiety in China [4]. Worldwide, it is estimated that 266–360 million operations are performed annually, and the number of surgical patients experiencing anxiety has been increasing, which is a serious public health problem [13]. We created a music video in Chinese exclusively showing the patients' most significant concerns about anesthesia and principle of ERAS, and found that during preoperative visit, watching the music video significantly halved the patients' perioperative anxiety. In addition, the music video was associated with higher first-attempt pass rate of the knowledge retention exam, higher extent to which the patient's most worried anesthesia concerns had been solved, higher satisfaction degrees of patients and their main family members, less hospital stay and total cost of hospitalization, indicating that the self-made music video could enhance the quality of preoperative visit and promote patients' recovery after surgery.

The results are consistent with that of Ying-Jie Che et al. [28] but contradicts that of Cornelie Salzwedel [29] which showed that use of a video for detailed anesthesia risk education did not change patient anxiety, but led to longer time of preoperative visit. Moreover, the effect of an informational video on patients' recovery is also controversial in different populations [28,30]. However, most of the reports confirm that the brief educational video or music improves patients' understanding of the procedure and risks of anesthesia [31,32]. One of the highlights of this study is the self-made educational video, which combined the patients' most significant concerns about anesthesia according to our survey, principle of ERAS and constructive suggestions on the cooperation between doctors and patients. The PASS rate after preoperative education was lower in Control group, suggesting that face-to-face oral education was not always effective in communicating the medical information and the music video effectively helped to solve the patients' most worried anesthesia concerns in China. Actually, the educational video has been widely applied in several surgical centers in China to introduce anesthesia details and principle of ERAS to increase acceptance and execution by patients and their families [22]. Our results indicate that more attention should be paid to different patients' most worried anesthesia concerns before surgery, which can finally help attenuating preoperative anxiety.

The current results do not negate the significance of preoperative face-to-face visit and education. Also, we don't think the educational video can replace the anesthesiologist' presence in preoperative visit. Our results showed advantages of educational video in preoperative visit, including using light music, rhyming lyrics and 2D cartoon to transmit information and enhance recall in patients. The music video was proved to deepen the patients' understanding of their most concerns about anesthesia, which was consistent with earlier study [33]. Moreover, the educational music video with vivid content is an ongoing learning material that allows the patients to consolidate knowledge with repeated use, which makes it more welcome in clinical practice, including preoperative visit. Meanwhile, a better understanding of anesthesia and less anxiety also led to more coordination between patients and healthcare workers during perioperative period and improve their outcomes. Some studies also reported that the educational video might help to shorten the visit time and bring potential possibility to reduce the workload of anaesthetists and improve their medical services [29,34]. However, although time cost of visiting in Group Video was a little shorter than that in Group Control, the difference was not statistically significant in our study; further study with larger sample size should be carried out to explore this issue.

Notably, this study has several limitations. First, considering that the video was only available in Chinese, the efficacy of it in non-Chinese speaking populations remains ambiguous. Videos in different languages should be prepared and evaluated in further study. Second, other sources of information that may affect the patients' knowledge were not explored. Patients may be influenced by accurate or inaccurate information from doctors, nurses, staff, friends, and the media. Third, types of surgery only included gynecological, urological and gastrointestinal surgeries in the study, and this was an important bias factor. Fourth, we did not measure the retention of knowledge on the day of surgery, which could help us to judge the source of anxiety on the day of surgery.

5. Conclusion

In short, our study highlights that an educational video about ERAS can enhance the quality of preoperative visit, improve patients' knowledge of anesthesia, decrease their preoperative anxiety, and promote patients' recovery after surgery. The multimedia intervention may be a critical complementary therapy to routine preoperative visits.

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Data availability statement

Data associated with this study has been deposited into a publicly available repository (RDD of Sun Yat-sen University, https://rdd.sysu.edu.cn/.

CRediT authorship contribution statement

Jibin Xing: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft. **Chulian Gong:** Conceptualization, Data curation, Formal analysis, Investigation. **Bin Wu:** Data curation, Formal analysis, Investigation, Methodology, Validation. **Yanting Li:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology. **Liling Liu:** Data curation, Formal analysis, Investigation, Methodology. **Panyang Yang:** Data curation, Formal analysis, Methodology. **Tienan Wang:** Data curation, Formal analysis, Investigation, Methodology. **Ziqing Hei:** Funding acquisition, Supervision, Writing – review & editing. **Shaoli Zhou:** Conceptualization, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization. **Chaojin Chen:** Formal analysis, Funding acquisition, Investigation, Methodology, Resources, Software, Supervision, Visualization, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e20536.

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