Research partner in Taiwan

Contents

- Four research papers on brain conducted by prof. Chin-Fei Huang, c Graduate Institute of Science Education, National Kaohsiung Normal University, Kaohsiung, Taiwan. Prof. Chin-Fei Huang is responsible for the brain wave research and she is the “Dancing with Seniors” point of contact in Taiwan.

- Two draft research proposals of psychology and brain wave by Weihsuan Lin.

- Research proposal: Using Senior Tango Dance to Enhance Elderly Physical Fitness and Mental Health

- Resumes of the main members of the teams

Mini Review-
Initial exploration of the significance of elderly-friendliness with the results of eye-tracking research

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With the development of medicine and health, the average life expectancy of population in the world continues to increase. In Asian countries, the average age is increasing year by year, and the demand for various services of the elderly has also increased significantly. The crisis facing the health care industry is not only the increase in users of health care resources and the decrease in the supply of medical care manpower, but also the caregiver is too young to understand the elderly's needs.

Many advanced countries in the world are facing an aging society, but research on the care environment that meets the needs of "age-friendliness" is relatively rare. It is not easy to promote many new technologies to promote the quality of life care, especially the acceptance of new technologies. How to understand the real needs of the elderly, and design the future care system to increase the acceptance of the elderly, and provide an analysis report on the status of long-term care is an important way to achieve "elderly friendship".

To practice the goal of "elderly friendship", in addition to the above-mentioned complete care system, how to activate the knowledge and abilities of the elderly and younger both, will be a major challenge in the future world (Carrington & Selva, 2010). Heilman and Nadeau (2020) implied that that most elderly did not like the caregiver since most caregiver just take care of their bodies without psychology or mental. Also, a lot of past researches focused on the health care and physical needs of the elderly, and less involved the psychological needs of the elderly for learning (Heilman & Nadeau, 2020).

On the other hand, Tirrito's (2003) research on the American senior industry has pointed out that since most senior citizens are economically stable and free time consumers, it can be estimated that the mature market will develop rapidly in the world. The most valued senior industries may be leisure, education, religious beliefs, etc.

These two aspects implied a possibility reason which is there are generation gaps between caregivers and care recipients. Furthermore, most care recipients are elderly and most caregivers are younger persons. Based on the initial ideas, this article aims to share the initial exploration of the significance of elderly-friendliness with the results of eye-tracking research.

Eight elderly and eight younger persons participated in this research (table 1). All of the participants are volunteers and have signed the consent form before joining this research. The average age of elderly is 67.2 years old and the average age of younger persons is 26.5 years old. The numbers of male and female are half. The sample size of this study is not a lot, however, the trend of initial results is significant and worthy of being reported.

Table 1 The information of participants

Group	**Total Number**	**Male Number**	**Female Number**	**Average Age**	**S.D.**
Elder	8	4	4	67.2	5.6
Young	8	4	4	26.5	10.4

In this study, all the elder and young group participants are asked to watch any area of interest in a bathroom in the same computer screen (Figure 1) with wearing the eye tracking technology. Each participant can watch the bathroom for one minutes. After watching the bathroom, the participants will be interviewed to explain what they just saw.

Figure 1 A set bathroom image in the same computer screen

The results from eye tracking data show that although the participants perform different eye tracking trajectory, the two groups of participant have different pattern. The elder group focused on floor and walls most (figure 2), and the young group focused on transparent glass and bath supplies most (figure 3). The interview data indicated that the elder group participants concerned about whether the floor is non-slip and if the wall have handrails or not. On the other side, the young group participants concerned about the beautiful overall design of the bathroom and the brand of the bath supplies.

Figure 2 The eye tracking trajectory pattern of elderly

Figure 3 The eye tracking trajectory pattern of young persons

Through eye tracking data, the results reflected that the needs and thoughts are very different from elderly and young persons. If the young persons could not understand the elderly's thoughts or needs, they could not be a suitable caregiver. Recently, a lot of advanced countries towards an aging society and want to build an age friendly environment. This study uses the preliminary research results to draw insights. In addition to letting everyone know the differences in thinking between young people and the elderly through experiments, it is also recommended that follow-up studies can use eye-tracking research methods to provide more diversified evidence so that the elderly's needs can be understood more clear in the near future.

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Age-related changes of task-specific brain activity in normal aging

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ABSTRACT

An important question in healthcare for older patients is whether age-related changes in cortical reorganization can be measured with advancing age. This study investigated the factors behind such age-related changes, using time-frequency analysis of event-related potentials (ERPs). We hypothesized that brain rhythms was affected by age-related changes, which could be reflected in the ERP indices. An oddball task was conducted in two experimental groups, namely young participants ($N = 15$; mean age 23.7 ± 2.8 years) and older participants ($N = 15$; mean age 70.1 ± 7.9 years). Two types of stimuli were used: the target (1 kHz frequency) and standard (2 kHz frequency). We scrutinized three ERP indices: event-related spectral power (ERPSP), inter-trial phase-locking (ITPL), and event-related cross-phase coherence (ERPCOH). Both groups performed equally well for correct response rate. However, the results revealed a statistically significant age difference for inter-trial comparison. Compared with the young, the older participants showed the following age-related changes: (a) power activity decreased; however, an increase was found only in the late (P3, 280–450 ms) theta (4–7 Hz) component over the bilateral frontal and temporo-frontal areas; (b) low phase-locking in the early (N1, 80–140 ms) theta band over the parietal/frontal (right) regions appeared; (c) the functional connections decreased in the alpha (7–13 Hz) and beta (13–30 Hz) bands, but no difference emerged in the theta band between the two groups. These results indicate that age-related changes in task-specific brain activity for a normal aging population can be depicted using the three ERP indices.

1. Introduction

Research to date has investigated several changes in brain activity associated with normal aging. During the past 10 years, researchers have found that, although neuroimaging offers good spatial resolution, electroencephalography (EEG) provides better time resolution, such as the measurement of ERPs. Studies of age-related differences in auditory ERPs have revealed that parietal P3 responses decrease in peak amplitude and increase in peak latency, as age increases [1,17,20]. Furthermore, empirical studies have demonstrated a significantly larger early negative component of auditory evoked potentials at approximately 80–110 ms for attended tones [10,14], this early attention effect (N1, latency approximately 100 ms) reflects a mechanism that enhances the processing of presented stimuli; and a late positive theta response peaking at approximately 250–500 ms, the late component (P3, latency approximately 300 ms) may be involved in processing stimuli when the participant's attention is engaged in renewing a memory [2,20]. Therefore, we may infer that the N1 and P3 components correlate with attention and the renewal of working memory, respectively.

Specific factors of age-related changes that are still poorly understood include temporal activity, phase-locking, and functional connectivity [18] in ERP studies. ERPSP, ITPL, and ERPCOH analyses of ERP assessment are used to investigate the frequency characteristics of cortical activity over a precise time period, and are important in understanding brain dynamics [6,22]. Earlier reports revealed that amplitude and phase-locking are interpreted as reflecting specific aspects of information processing [24]. Yordanova and Kolev showed that the effects of aging on phase-locking may be mediated primarily by plasticity within information processing networks, which is associated with cognitive processing abilities or strategies [23]. Recently, an event-related oscillation study in haptic recognition memory task has shown that older adults recruited more brain resources than young adults [21], and the differences were observed in both the alpha and

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beta bands. Furthermore, an EEG study found that a decline in frontal integration and activity is related to normal aging, and the lower synchronization between brain regions observed in elderly compared to adults [8]. Klimesch et al. demonstrated that phase reorganization of task-relevant oscillations exhibit a typical interactive relationship between pre- and post-stimulus for ERP amplitude, ERP latency, and power; these parameters reflect frequency characteristics of the theta and alpha frequency ranges [12]. Though there is a considerable amount of researchers using various methods to analyze EEG oscillations [8], more information about age-related changes in ERP oscillations is needed. It would be useful to investigate temporal responses among the cognitively aging population for cortical activation processes and the dynamics of the stimulus. Measures of interest would include temporal activity, pattern stability, and functional connectivity for the different ERP components [6]. Yet only a few studies of aging focused on such aspects or discussed in ERP oscillations [23]. We hypothesized that brain rhythms was affected by age-related changes, which could be reflected in the ERP indices (ERPSP, ITPL, and ERPCOH). As our view predicts, lower ERP indices are associated significantly with a more decline with age, so those are the indications on which we focus.

We investigated normal age-related changes for power activity, phase stability, and functional connectivity. We used time-frequency analysis of ERPs with ERPSP, ITPL and ERPCOH. Investigation of these parameters allows researchers to better understand the nature of brain dynamics [6,22], especially in early attention and late information processing. To our knowledge, this was the first ERP study to examine information processing, pattern stability, and interhemispheric connectivity in a normal aging population, using ERPSP, ITPL, and ERPCOH analyses.

2. Materials and methods

The participants were recruited in two age groups: young people ($N = 15$; mean age 23.7 ± 2.8 years; mean years of education = 16.5 ± 2.4; 10 male and 5 female) and older people ($N = 15$; mean age 70.1 ± 7.9 years; mean MMSE score 29.2 ± 0.7; mean years of education = 10.6 ± 3.5; 10 male and 5 female). None of the participants reported any neurological or psychiatric disease. None of them suffered from high blood pressure (BP), diabetes, heart disease, or systemic lupus erythematosus (SLE), and none used medications (aspirin, antibiotics). The study protocol was approved by the medical ethics committee of the National Kaohsiung Normal University. Informed consent was obtained from all participants engaging in this research.

All participants in both groups received the same auditory task and assessment. Two types of stimuli used in an auditory oddball task were the target (1000 Hz frequency) and standard (2000 Hz frequency) tones with 85 dB sound pressure level. Both stimuli comprised pure tones of 20 ms duration, with a 10 ms rise/fall time. The ratio of the target to standard stimuli was 1:4, and the stimuli were presented in random order. Participants were required to press a button each time they detected a target stimulus, but not a standard stimulus. The study session lasted for 5 min for each participant, totaling 150 stimuli with a 2 s inter-stimulus interval. Mean reaction time and correct response rate were recorded.

The EEG recordings were performed with 30 electrodes positioned according to the International 10–20 system with a sampling rate of 1000 Hz. The signal was filtered (FIR, 0.1–30 Hz, 12 dB/octave and zero phase shift) with an epoch length of 200 ms before and 1800 ms after stimulus, which included a 200 ms pre-stimulus baseline. Data from single-trial epochs exhibiting excessive movement artifact (>90 μV) were rejected. After removal of artifacts, between 28 and 30 target events remained for each participant, from which a mean was calculated. The EEG data were recorded in a sound-attenuated room with participants in an eyes-closed condition.

Time-frequency maps of auditory ERP data were used in the theta (4–7 Hz), alpha-1 (7–10 Hz), alpha-2 (10–13 Hz), alpha (7–13 Hz), and beta (13–30 Hz) bands. The data were analyzed in an analysis of variance (ANOVA) from three sites (Fz, Cz, and Pz). The N1 was 80–140 ms for an auditory target stimulus, whereas P3 was 280–450 ms.

ERPSP, ITPL, and ERPCOH of time-frequency analysis are used to investigate the frequency characteristics of cortical activity over a precise time period, and are important in understanding brain dynamics [6,22]. ERPSP characterizes the activity of cortical sites during information processing. The analyses performed with relative power, which is defined as:

$$\mathrm{ERPSP}(f,t) = \frac{1}{n}\sum_{i=1}^{n}(F_i(f,t))^2 \tag{1}$$

where for n trials, $F_i(f,t)$ is the spectral estimate of trial i at frequency f and time t. The ITPL is defined as [22]:

$$\mathrm{ITPL}(f,t) = \frac{1}{n}\left|\sum_{i=1}^{n}\frac{F_i(f,t)}{|F_i(f,t)|}\right| \tag{2}$$

where $||$ represents the complex norm. The ITPL value reflects the stability of the performed pattern, and ranges from 0 (purely non-phase-locked activity) to 1 (perfect phase-locking); that is, greater values correspond with better phase-locking across trials [6].

If x and y denote two signals from two electrode sites. The ERPCOH is defined as

$$\mathrm{ERPCOH}^{x,y}(f,t) = \frac{1}{n}\sum_{i=1}^{n}\frac{F_i^x(f,t)F_i^y(f,t)^*}{|F_i^x(f,t)F_i^y(f,t)|} \tag{3}$$

where for n trials, $F_i^x(f,t)$ is the spectral estimate of trial i at frequency f and time t on the signal x, while $F_i^y(f,t)^*$ is the complex conjugate of $F_i^y(f,t)$. ERPCOH reflects the degree of coherence between two channels in the sets of trials, ranging in value from 0 (complete loss of synchronization) to 1 (perfect synchronization) [6]. Conditions of high coherence correspond to stronger functional connectivity, which relates to cognitive information processing and neural communication [7].

In this study, short-time Fourier transform (STFT) of ERP signals provided an estimation of the power spectrum. We calculated the ERPSP, ITPL, and ERPCOH of the signals in each frequency band using time-frequency transform. To gain 1 Hz frequency and 4 ms time resolution, we used a sliding temporal Hanning window of 256 points. Moreover, the frequency band from 3.9 Hz to 30 Hz in the time-frequency domain was adopted to avoid possible edge effects distorting the measurements. All three ERPs indices were analyzed via EEGLAB v9.0 [6]. Statistical results were obtained with repeated measure ANOVA using SPSS 12.0. To examine the specificity of the findings for all of the channels, we further performed auxiliary analyses with ERPSP and ITPL. Data were analyzed using the t-test for paired groups.

3. Results

Older participants obtained smaller P3 peak amplitude, but longer P3 peak latency at electrode sites Fz, Cz, and Pz, as shown in Fig. 1. For the early component, N1 showed no significant age differences in amplitude ($F[1,28] = 2.37$; $p = .126$). Furthermore, N1 latencies were prolonged in older participants compared with the young, but the difference did not achieve statistical significance. The P3 amplitude was higher for young participants than the older participants ($F[1,28] = 3.551$; $p = .002$). The N1 and P3 amplitude in

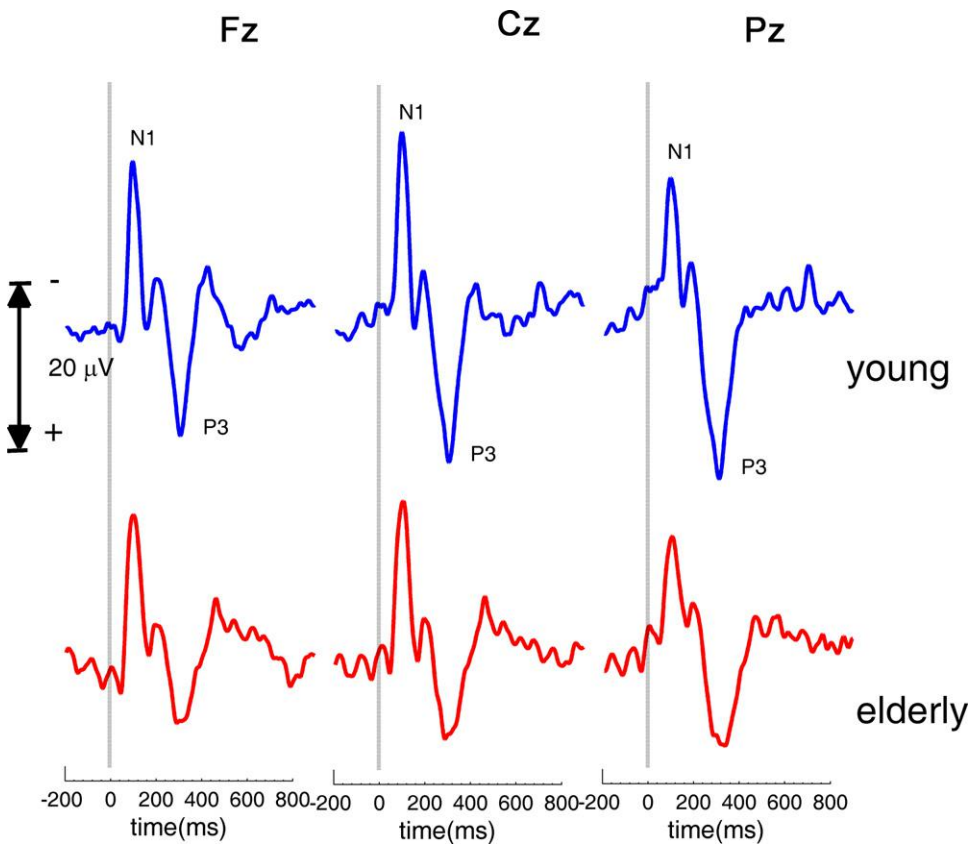

Fig. 1. Grand-averaged ERP waveforms at electrode sites Fz, Cz, and Pz for auditory target.

response to the target stimulus was maximal at the central region for the young group and the parietal region for the older group. Furthermore, P3 latencies were significantly prolonged among older participants compared with the young. The mean reaction time to the target was longer for older participants (404 ± 60 ms) than for the young (368 ± 50 ms). Both age groups performed equally well on correct response rate (young: $97.7 \pm 6.8\%$; older participants: $96.5 \pm 5.6\%$). These results were consistent with previous findings from ERP studies of normal aging [19].

The mean values of ERPSP, ITPL, and ERPCOH are presented in Fig. 2. The spectral power analysis showed that older participants attained significantly lower ERPSP than the young ($F[1,28] = 5.124$; $p = .024$). A frequency × age interaction analysis ($F[2,56] = 4.751$; $p = .009$) demonstrated that alpha power was lower in older participants ($p < .001$). An electrode × age interaction analysis ($F[2,56] = 5.711$; $p = .004$) showed that power was lower for older participants at Pz ($p < .001$). A trend for theta power to be higher in older patients at Fz is shown in Fig. 2A.

For phase-locking analysis, young participants demonstrated substantially stronger phase-locking than the older patients ($F[1,28] = 8.685$; $p = .003$). A frequency × age interaction analysis ($F[2,56] = 1.617$; $p = .200$) (Fig. 2B) showed that the difference in phase-locking between the two age groups was statistically significant in the theta band ($p = .002$). A component × age interaction analysis ($F[1,28] = 2.039$; $p = .154$) (Fig. 2C) revealed that older participants attained lower phase-locking in the early component ($p = .002$).

Regarding phase coherence analysis, the older participants obtained a lower ERPCOH value ($F[1,28] = 20.822$; $p < .001$). A frequency × age group interaction analysis ($F[2,56] = 5.470$; $p = .004$) (Fig. 2D) indicated that older participants performed significantly lower in the alpha ($p < .001$) and beta ($p = .010$) bands. A component × age interaction analysis ($F[1,28] = 0.013$; $p = .911$) showed that the ERPCOH value of the older participants was significantly lower for both the early ($p = .002$) and late ($p = .001$) components. An electrode × age interaction analysis ($F[2,56] = 0.358$; $p = .699$) also showed that the older participants attained significantly lower ERPCOH values for the F3–F4 electrodes ($p = .042$), C3–C4 electrodes ($p = .009$), and P3–P4 electrodes ($p = .001$).

No significant difference was found between the groups for the early component (see Fig. 3A). Theta power in the late component over the bilateral frontal and temporo-frontal areas (Fig. 3B) was higher in older participants than in the young, whereas young participants attained higher alpha-1 and alpha-2 bands over the right parietal area.

Fig. 4 presents the various frequency bands in ITPL analysis of the early component for all of the channels between the two groups. The mean values of ITPL were lower for older participants in the theta band over the parietal/frontal (right) areas (see Fig. 4A), but no difference was found in the alpha-1 band (see Fig. 4B). The older participant attained lower values for the alpha-2 band at the right posterior temporal position (see Fig. 4C).

4. Discussion

Our results that indicated a difference in theta band between older and young participants was in line with previous research in the field of functional neuroimaging. Prior studies provided clear evidence that the age-related increase in bilateral frontal activity during cognitive tasks is associated with compensatory processes in response to a decline in the brain's processing efficiency [4,5,9,18]. Increased activity in older participants is considered to be associated with enhanced memory performance [15]. In this study, although the older participants demonstrated less P3 amplitude and delayed latency relative to young participants, no statistically significant difference emerged between the two age

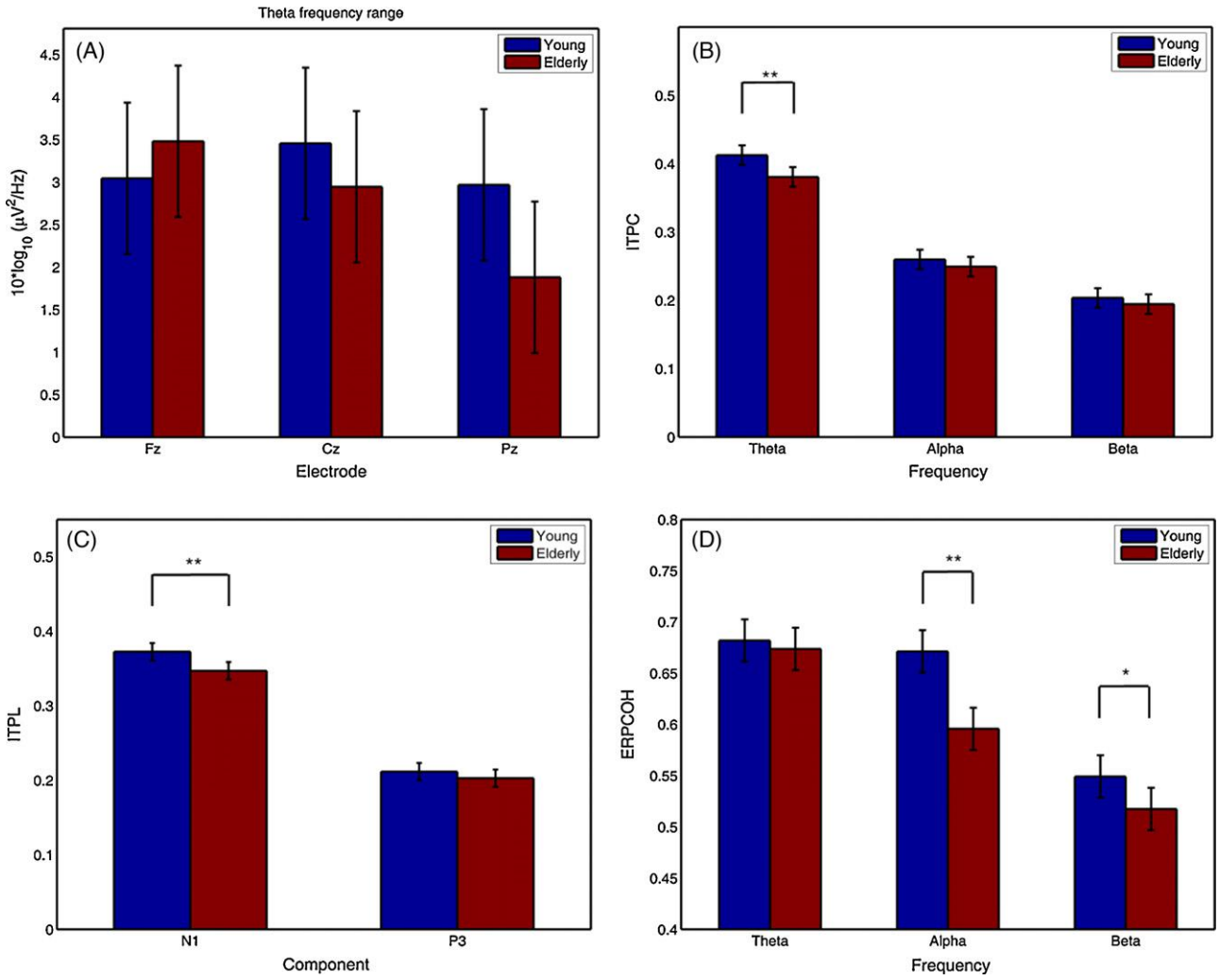

Fig. 2. The mean values of three ERP indices: electrode × age interaction under theta frequency range for power value (A), frequency × age interaction for ITPL value (B), component × age interaction for ITPL value (C), and frequency × age interaction for ERPCOH value (D). Vertical bars indicate 95% confidence intervals. Statistically significant differences are marked with symbols representing the significance levels ($^{*}p < .05$, $^{**}p < .01$).

groups for correct responses to the target. Evidently, for an older person to perform a task as efficiently as a young person, they must enhance the bilateral frontal and temporo-frontal areas by increasing the late theta component.

Theta power was higher at Fz in older participants than in the young, particularly in the late component. This enhanced theta power of the late component in the frontal scalp can be interpreted as cognitive information processing of the brain. The results of auxiliary analysis from the full-scalp spectral power revealed the maximum difference in scalp topography occurring in the theta band. The findings of the bilateral frontal and temporo-frontal activity of older participants observed at the 280–450 ms time window proved to be sensitive for the effects of normal aging and may play a role in maintaining information in working memory. This enhanced frontal and temporo-frontal activity in older people is likely to facilitate the information processing stages.

The compensatory model hypothesis [4,9] and scaffolding theory [16] demonstrated that compensatory activation can be considered a characteristic of normal aging [18]. It is unclear whether this enhanced frontal activity reflects compensatory activation, or whether it resulted from pathological changes. One explanation suggests that an increased frontal theta power reflects an aging mechanism in which brain dynamics move from a stable state (lower theta power) to a relatively unstable state (higher theta power); decreased connections between different brain areas are adversely affected by a lack of control over increasing theta power. Consequently, older patients experience increased risk of the loss of connectivity for information processing as their age advances [11].

Another important finding for ITPL was that the degree of enhanced early attention among multiple cortical areas (frontal, central, and parietal lobes) tends to increase phase synchronization. In contrast, a low degree of phase-locking reflects a low level of stability in attention. In all participants, the early theta oscillation expressed higher phase-locking than the late ones, which arguably reflected early attention-related processing in working memory. In the conceptual framework of the theta system in the brain, the strong phase-locking is believed to result from phase synchronization between neuronal oscillations [23]. In brief, the ITPL of ERPs revealed that young participants displayed far greater stability in the evoked patterns of the early theta band than did the older participants, independently of amplitude measures.

A typical finding was that the functional connections decreased in the alpha and beta bands of older participants. This finding may reflect that the mean reaction time of older people to the target was longer than that of the young. However, no significant difference emerged for the phase coherence in the theta band between the two age groups. Furthermore, it appeared that

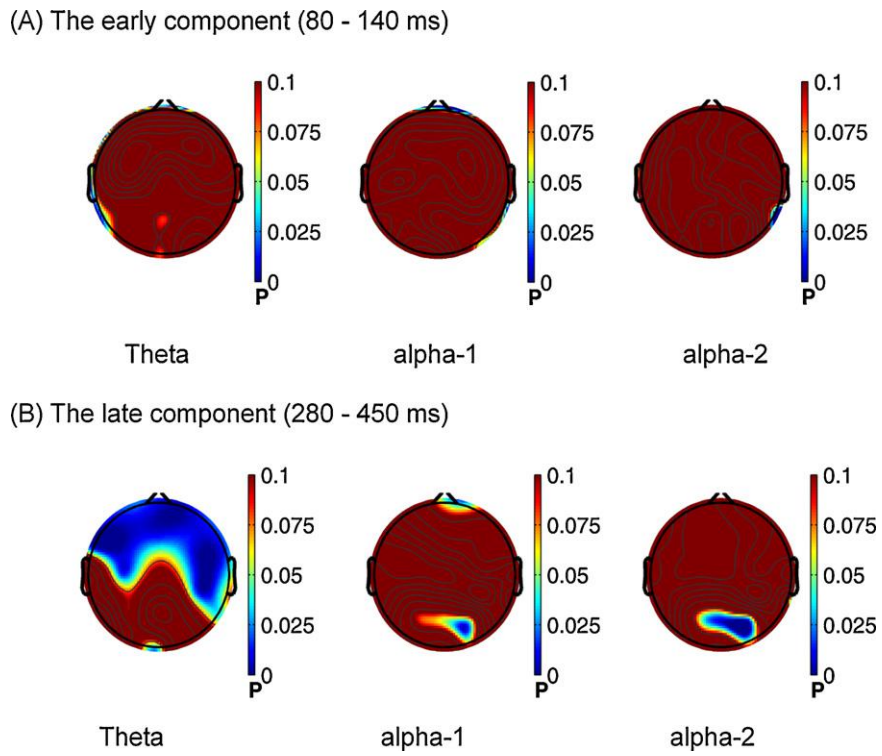

Fig. 3. Topographic differences in ERPSP between the two groups. The mean values of ERPSP were estimated at the 80–140 ms (A), and at the 280–450 ms (B) time windows. The *p*-values were calculated from the *t*-test.

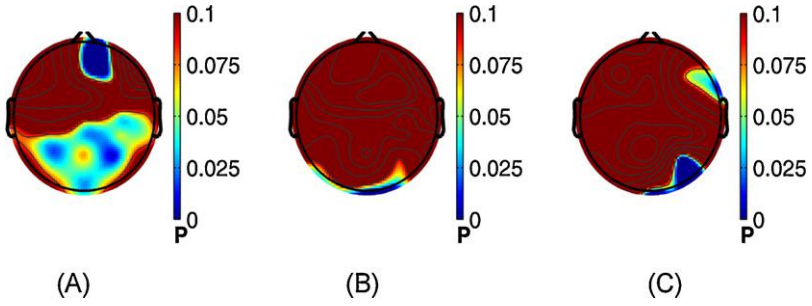

Fig. 4. Topographic differences in ITPL between the two groups. The mean values of ITPL in the theta (A), alpha-1 (B), and alpha-2 bands (C) were estimated at the 80–140 ms time window. The *p*-values were calculated from the *t*-test.

decreased phase-locking and functional connectivity, together with increased spectral power of the late theta responses, may accompany the aging process. A possible explanation is that enhanced oscillatory activity reflects an increased level of performance as a functional decline associated with normal aging. A similar enhancement of oscillations in haptic memory task has also been presented by Sebastián et al. [21].

This study was subject to several limitations. First, however due to the small sample size in this study these results should, perhaps, be interpreted with caution. Second, we did not include older participants who displayed poor performance. Such a design allowed us to investigate age-related changes in power activity to differentiate between good and poor memory task performers. Third, regarding age-related differences in P1, P2, and N2 components, the literature contains inconsistent information on peak amplitude and latency [13]. Hence, we analyzed only the N1 and P3 components, especially in early attention and late information processing which we focus. The above limitations affect the generalizability of our findings. Further studies are required in this line of inquiry.

5. Conclusions

To conclude, this study conducted three independent analyses, which are regarded as complementing each other in aging studies. This approach allowed us to explore a comprehensive understanding of age-related changes. We demonstrated that a decrease of phase-locking and phase coherence caused by aging was accompanied by increased activity in the late theta response, and that this late component may reflect the effect of cognitive processing [2,3,20]. Our study simultaneously examined ERPSP, ITPL, and ERPCOH, and provided a sensitive and multi-feature indicator of attention and information processing in normal aging. Although this study used relatively simple tasks, differences in early attention and late cognitive process were detected reliably between the two age groups. Despite previous reports that gamma band was correlated to cognitive process, the current study did not analyze the gamma band. However, further work is necessary to examine age-related changes using a larger sample size. Future research could investigate ERPs in attention and cognitive measures, to conduct a

structural analysis of brain connectivity and determine risk factors for neurological disease.

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Exploring the influence of natural environment on university students' scientific creativity through neuroscience research

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Abstract

This study aims to explore the influence of natural environment on creativity through brainwave research. There are 30 university students participated in this study (Mean ± S.D. = 19.6 ± 0.8 years old; male=17, female=13). All participants were volunteers and signing the volunteer consents. In this study, the participants were asked to complete the parallel Scientific Creativity Tests (5 minutes) and detecting the neuroscience data before and after walking around in different places. All the participants walked for 5 minutes and took a rest for 10 minutes. The results from tests and neuroscience data showed that the participants showed significantly higher scientific creativity after walking in the natural environment/ classroom building than pre-test. Further, the neuroscience data show the participants performed significantly higher scientific creativity after walking in the natural environment than in the classroom building. The further implication will be showed in the presentation.

Keywords: natural environment, neuroscience, scientific creativity

1. Introduction

The contemporary world is changing rapidly and information explosion, the static knowledge could not reflect the world changing and most of the questions could be answered through internet, what people need to learn? What will be the core value of human kind's knowledge? Sun, Wang, Wegerif and Peng (2022) mentioned that creativity might be the most important skill in 21st Century. Previous studies also indicated that the creativity ability is a high level cognition ability to appropriate ideas to solve problems (Ma, 2009; Sun et al., 2022). In other words, in the future, how to improve students' creativity will be more and more important.

Although creativity is very important, Kozhevnikov, Ho and Koh (2021) mentioned that scientific creativity, which is a kind of specific domain creativity, could reflect students' social representation. That is to say, scientific creativity could more accurately reflect students' ability to face real-life problems. Based on these background information, this study focused on exploring students' scientific creativity.

In recent years, there are a lot of researches investigated students' scientific creativity (Dogan & Kahraman, 2021; Atesgoz & Sak, 2021), but, most of these studies focused on the children, elementary school students or high school students. There are less research focused on university students' scientific creativity. However, think carefully, university students will connect to work immediately after graduation, they should be the group that need creativity most to solve problems. For this reason, this study aims to explore university students' scientific creativity.

Furthermore, past studies indicated that creativity will be shown in relax emotion, and someone who reached in more information will produce more creativity. This study hypothesized that the natural environment which involved in huge information and making people relax will be the best material to induce

creativity. For proving this hypothesis, the purpose of this study is to explore the influence of natural environment on university students' scientific creativity through neuroscience.

Farrugia, Lamouroux, Rocher, Bouvet and Lioi (2021) indicated that neuroscience data could provide a further evidence to explain the performance of creativity ability. Previous studies mentioned that alpha band activity is correlated with creative performances, and the higher alpha power indicated the greater creativity performance (Fink & Benedek, 2014; Stevens & Zablina, 2019). This study referred the definition and criteria of previous studies, to explain the participants' scientific creativity ability by collecting and analyzing the alpha power of the participants' neuroscience data.

2. Materials and Methods

2.1 Participants

This study was conducted at an university of the south of Taiwan. Thirty university students participated in this study (Mean ± S.D. = 19.6 ± 0.8 years old; male=17, female=13). All participants were asked to complete the experimental task by wearing the brainwave cap to collect the neuroscience data. All participants were confirmed to be mentally healthy without a history of neurological or psychiatric disorders, and all gave voluntary consent to participate in the neuroscience experiments.

2.2 Procedure and Instrument

In this study, the participants were asked to complete the parallel Scientific Creativity Tests (5 minutes) and detecting the neuroscience data before and after walking around in different places.

There are three parallel Scientific Creativity Test (Hu & Adey, 2002) which included in Test A, Test B and Test C. The results from pilot study with 50 university students' data showed that the "Degree of Difficulty" and the main findings did not

reach in significant differences between these three Tests. That means the three Tests could reflect the similar results, therefore, these three Tests could be the parallel test.

The participants were divided into two groups which is group A and group B. Group A is walking in the classroom building for 5 minutes in the first step and walking in a natural garden of the campus for 5 minutes in the second step, while the group B is opposite. After walking for 5 minutes, all the participants would take a rest for 10 minutes. (Figure 1).

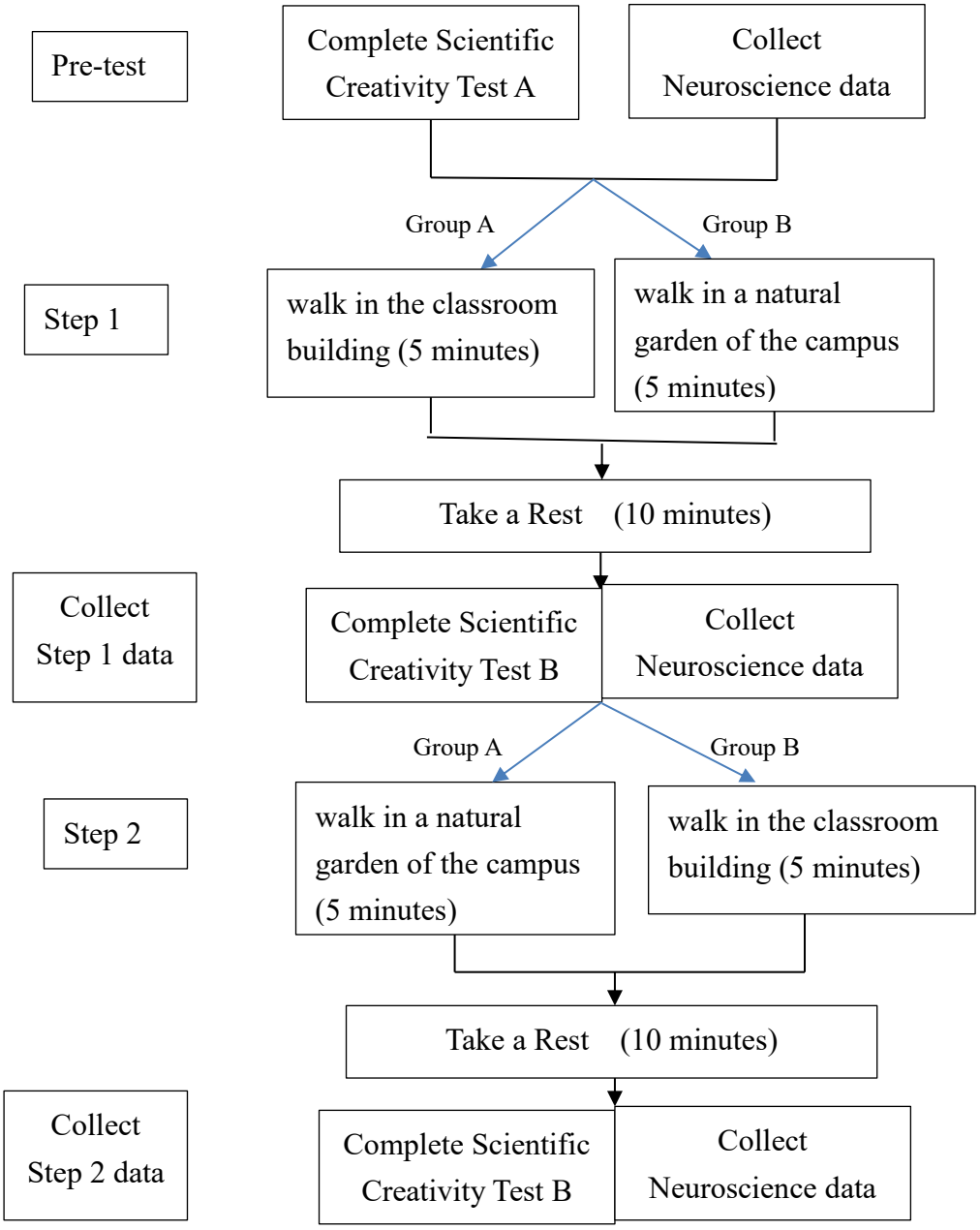

Figure 1 procedure and instrument of this research

2.3 Data Collection and Analysis

This study adopted the neuroscience technology (see in figure 2) to collect the data of the participants' brain wave reactions.

(a)

(b)

Figure 2 (a) the simulation example of the participants' experiment situation (b) the neuroscience technology (The pictures (a) and (b) were provided from Sheng Hong Precision Technology Co.)(http://www.brain-sh.tw/product_content.php?p_id=134)

This study adopted the EEG signal combinations reflection system which was developed by Sheng Hong Precision Technology Co. Ltd. In this system, the raw neuroscience signals will be collected 512 data per second. The raw data can be translated into 8 FFT frequency bands of neuroscience data which included in delta wave (1-4 Hz), theta wave (4-7 Hz), alpha wave (8-14 Hz), beta wave (15-30 Hz), low gamma wave (30-50 Hz) and high gamma wave (> 50 Hz).

All of the participants' raw neuroscience signals data were collected while they were participating in the experiments. Then, these data would be translated in statistical data through the neuroscience technology system automatically. This study focused on alpha wave more, the higher alpha power indicated the greater creativity.

In this study, the average alpha power data of neuroscience research from experiments were been compared by paired *t* test. In this study, the statistical analysis

was been analyzed by SPSS 27 software.

3. Result and Discussion

Based on the research procedure, this study compared each 2 variables by using paired *t* test (table 1). In table 1, the variable "pre-test alpha" means the alpha power value of neuroscience data before the participants joining this study. The identifications about "step 1 alpha" and "step2 alpha" refers to the alpha power values which collected by the participants at different stages. In table 1, the higher scores of neuroscience data indicated that the participants showed greater scientific creativity (Farrugi et al., 2021).

Otherwise, the variable "pre-test Test" means the participants' scores of Scientific Creativity Test before the participants joining this study. The identifications about "step 1 Test" and "step2 Test" refers to the participants' scores of Scientific Creativity Test which collected by the participants at different stages. In table 1, the higher scores of n Scientific Creativity Test indicated that the participants showed greater scientific creativity.

Table 1 The paired *t* test analysis of each 2 variables of neuroscience and Test data (N=30)

Pair	Source	Mean	S. D.	*t*	*p*
1	pre-test alpha	3014.63 μ V	1825.85 μ V	-4.13***	<.001
	step 1 alpha	17629.57 μ V	18888.19 μ V		
2	pre-test alpha	3014.63 μ V	1825.85 μ V	-4.75***	<.001
	step2 alpha	16512.87 μ V	15341.19 μ V		
3	step 1 alpha	17629.57 μ V	18888.19 μ V	.31	.761
	step2 alpha	16512.87 μ V	15341.19 μ V		
4	pre-test Test	29.90 points	9.25 points	-7.42***	.<.001
	step 1 Test	41.23 points	12.96 points		

5	pre-test Test	29.90 points	9.25 points	-4.46***	<.001
	step2 Test	41.23 points	9.68 points		
6	step 1 Test	41.23 points	12.96 points	.00	1.00
	step2 Test	41.23 points	9.68 points		

Note: * p<.05; ** p<.01; *** p<.001

The results from table 1 show no matter which steps, the participants show higher alpha power value and higher test scores than pre-test. The findings indicate that the participants show greater scientific creativity than pretest, and both the neuroscience data and Scientific Creativity Test show the same findings. However, since the group A and group B walked in different places, the results from step 1 and step 2 might cannot show the differences. The results are supported by Sun et al. (2022), their research findings show that the multiple stimuli could improve students' creativity.

For clarifying if the natural environment could improve students' scientific creativity, this study reprocessing data allocation. In table 2, the variable "pre-test alpha" means the alpha power value of neuroscience data before the participants joining this study. The identifications about "natural alpha" and "classroom alpha" refers to the alpha power values which collected by the participants at different places. In other words, this study chose group A students' step 2 alpha power data and group B students' step 1 alpha power data to be the "natural alpha". Similar, the "classroom alpha" was collected by group A students' step 1 alpha power data and group B students' step 2 alpha power data. In table 2, the higher scores of neuroscience data indicated that the participants showed greater scientific creativity.

In the same way, the variable "pre-test Test" means the participants' scores of Scientific Creativity Test before the participants joining this study. The identifications about "nature Test" and "classroom Test" refers to the participants' scores of Scientific Creativity Test which collected by the participants at different places. In table 2, the

higher scores of n Scientific Creativity Test indicated that the participants showed greater scientific creativity.

Table 2 The paired *t* test analysis of each 2 variables of neuroscience and Test data (N=30)

Pair	Source	Mean	S. D.	*t*	*p*
1	pre-test alpha	3014.63 μ V	1825.85 μ V	-5.28***	<.001
	natural alpha	23302.40 μ V	20449.30 μ V		
2	pre-test alpha	3014.63 μ V	1825.85 μ V	-4.33***	<.001
	classroom alpha	10903.03 μ V	9753.91 μ V		
3	natural alpha	23302.40 μ V	20449.30 μ V	4.03	<.001
	classroom alpha	10903.03 μ V	9753.91 μ V		
4	pre-test Test	29.90 points	9.25 points	-5.94***	.<.001
	natural Test	42.00 points	11.80 points		
5	pre-test Test	29.90 points	9.25 points	-4.93***	<.001
	classroom Test	40.47 points	11.01 points		
6	natural Test	42.00 points	11.80 points	.49	.628
	classroom Test	40.47 points	11.01 points		

Note: * p<.05; ** p<.01; *** p<.001

The results from table 2 show that both neuroscience data and Scientific Creativity Test data referred the similar findings, that is no matter walking in natural environment or in classroom building, the participants' scientific creativity performances are better than pre-test. Furthermore, the neuroscience data also indicate that walk in natural environment places could improve university students' alpha power value in their brain wave. However, in Scientific Creativity Test, although the natural Test scores are higher than classroom Test, there is no significant differences between these two scores.

This finding in table 2 indicate that the neuroscience data could provide more

detailed analysis results to make the overall interpretation more objective and meticulous. This claim supported by Farrugi et al. (2021).

4. Conclusion

The purpose of this study is to explore the influence of natural environment on creativity through brainwave research. There are 30 university students participated in this study. The participants were asked to complete the parallel Scientific Creativity Tests (5 minutes) and detecting the neuroscience data before and after walking around in different places, one place is classroom building and the other place is the natural garden in the university campus. All the participants walked for 5 minutes and took a rest for 10 minutes in each step.

The results from tests and neuroscience data showed that the participants showed significantly higher scientific creativity after walking in the natural environment and classroom building both than pre-test. Further, the neuroscience data show the participants performed significantly higher scientific creativity after walking in the natural environment than in the classroom building. However, although the Scientific Creativity Test scores of walking in the natural environment are higher than walking in the classroom building, there is no significant differences between these two scores. The finding indicate that the neuroscience data could provide more detailed analysis results to make the overall interpretation more objective and meticulous

There are two main implications of this study. First, to provide multiple stimuli could improve university students' scientific creativity even just push them to walk outside. Second, neuroscience research might could provide more detail information to explain the cognitive performance, this study suggests further researchers to consider neuroscience research orientation in educational researches.

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Explore the effects of forest travel activities on university students' stress affection

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This study aims to explore the effects of forest travel activities on university students' stress affection. Forty volunteer university students participated in this study. All participants were asked to complete physiological (Heart Rate Variability) and psychological (Brief Profile of Mood State and State–Trait Anxiety Inventory) tests before and after the travel activities. The results reported that students' heart rates were significantly lower after the forest travel activities than before. All domains of negative mood and anxiety decreased from the pre-test to the post-test. This study found that university students could feel less stressed if they went on forest travel activities.

KEYWORDS

forest travel, physiological health, psychological health, stress affection, university student

1 Introduction

Stress is a challenge for modern society and a health pandemic of the 21st century (Tsunetsugu et al., 2007; Park et al., 2010; Fink, 2017). This issue has attracted scholars since antiquity because of stress's detrimental impacts on mental and physical health (Fink, 2017; Ribeiro et al., 2018; Miriam et al., 2021). Nowadays, high-stress levels are a social problem experienced by university students worldwide. The university students felt high pressure not only because of academic pressure or taking tests but also because of environmental learning changes, financial problems, and family expectations (Ribeiro et al., 2018; Kim et al., 2021). Additionally, social issues in the whole world also affect university students' mental health, such as COVID-19 (Schwartz et al., 2021). Based on previous studies, more than 50% of university students feel anxious and depressed in their daily life, especially in Asian countries (Craggs, 2012; Downs and Eisenberg, 2012). Take China as an example; there were about 7.6 million university graduates in 2018 (National Bureau of Statistics of China, 2019). These numbers mean that one student needs to compete with many other students in their studies through to their working life, which causes them stress in China (Wen et al., 2022; Jiang, 2023). The term "stress" was introduced by Hans Selye, which can be understood as the body's response to problems or tasks, depending on how the individual controls them (Fink, 2017; Dagnino-Subiabre, 2022). The results of excessive stress can lead to a negative impact on life, such as drug misuse, suicide, insomnia, exhaustion, depression, and reduced academic performance

(Shah et al., 2010; Downs and Eisenberg, 2012; Cavallo et al., 2016; Ribeiro et al., 2018). Furthermore, stress is implicated in a significant portion of lifestyle-related diseases, including hypertension and elevated cortisol levels, increasing susceptibility to infections and disrupting glucose tolerance, ultimately contributing to diabetes (Merabet et al., 2022; Sharma et al., 2022). Over time, these health issues may lead to arteriosclerosis, constituting a substantial portion of illnesses and incurring economic damage to the healthcare system (Inoue, 2014). University students are one of society's future human resources. Strengthening their physical and psychological health is vital for creating the foundation for a healthy future in society. So, universities need strategies or methods to help students feel less stressed.

Among many strategies to decrease stress, exposing students to nature and the green environment is considered one of the most effective ways (Hansen et al., 2017; Liu et al., 2018; Markwell and Gladwin, 2020; Antonelli et al., 2021). A growing number of studies have explored the topic of "forest therapy" and "forest bathing" in enhancing physical and mental health in recent years (Tsunetsugu et al., 2007; Park et al., 2010; Nan et al., 2013; Song et al., 2017; Bielinis et al., 2018; Chen et al., 2018; Hassan et al., 2018; Liu et al., 2018; Lin et al., 2019). Both approaches, "forest therapy" and "forest bathing" involve travel or therapeutic activities in forest environments. They have been found to contribute to reducing anxiety and stress and improving mental health (Park et al., 2010; Song et al., 2015; Bielinis et al., 2018; Chen et al., 2018), but also helped individuals decrease negative feelings (Korpela, 2003; Shin et al., 2012; Chun et al., 2017; Bielinis et al., 2019; Lyu et al., 2019) and improve positive emotions (Ikei et al., 2014; Jung et al., 2015; Sonntag-Öström et al., 2015; Gong et al., 2017; Meyera and Botsch, 2017; Oh et al., 2017; Bielinis et al., 2018; Yau and Loke, 2020; Li et al., 2021). When compared to urban environments, the forest environment helps university students have lower pulse rates and blood pressure, and walking in the forest environment favorably influences cardiovascular responses and helps them reduce stress (Lee et al., 2014). In addition, the profile of mood states (POMS) decreased after the forest experience (Mao et al., 2012a,b). Also, university students were encouraged to frequent the forests frequently, which helps reduce anxiety and depression (Zhuo and Sun, 2014). Although previous studies have provided evidence to illustrate the positive effects of forest travel activities on health, most focused on aging or sick people (Shin et al., 2012; Lee et al., 2014; Sonntag-Öström et al., 2015; Chun et al., 2017; Chen et al., 2018; Rajoo et al., 2020; Kotera and Fido, 2021). There are not currently so many studies investigating whether forest travel activities are beneficial to young people, especially university students.

Forest travel activities are recreational and calming activities in the forest that bring comfort and decrease stress for participants, such as strolling, combined with breathing in the air (Li et al., 2007; Tsunetsugu et al., 2010; Oh et al., 2017; Kil et al., 2021) and observing and listening to the natural world. Forest travel activities are not the same as hiking or physical activity (Yoshinori et al., 1998). Participants experience the forest landscape, the ambiance of the forest, the sounds of the forest, and the fresh air via their senses (Cheng et al., 2021; Li et al., 2021). Participants can obtain a comprehensive awareness of the ecology in this forest and a better appreciation of the diversity of the natural world (Lee et al., 2014). As a result, forest travel improves physical and mental health (Lee et al., 2014; Li et al., 2021). In addition, green spaces on campus help students breathe fresh air, relax, or stroll, which contributes to enhancing their mental health after school and decreasing their stress levels (Ribeiro et al., 2018). However, different forests may have different impacts on stress affection because their trees, concentrations of anions, and phytoncide chemical components are different (Hauru et al., 2012; Norimasa et al., 2014; Yu et al., 2019; Jamali et al., 2020).

In this study, we take forest travel activities as the core concepts to explore their effects on university students' stress affection. In the southern of China, Lanyuan Forest was selected for this investigation. If the activities in this forest could assist in reducing students' stress, then this forest or others might become a natural therapeutic place for university students. Whereby, extending this therapy model to other schools with forests attached to the school or organizing for students to have forest travel activities in nearby woods could be considered. Therefore, this study sought to seek the answer to the main question "How might travel activities in the Lanyuan Forest assist university students in coping with stress?." Based on the main question, the following research question was formulated and tested in this study: Do forest travel activities improve both physiological and psychological health, ultimately reducing stress among university students?

2 Materials and methods

2.1 Participants

This study was conducted in Fujian, China. The sample size for the statistical comparison between pre-test and post-test was determined based on the following calculation: with a significance level (alpha) of 0.05 and a power (1 - beta) of 0.80, a medium effect size (Cohen's $d = 0.50$), and a two-tailed t-test, the required sample size was estimated using G*Power statistical software. The calculation indicated that a minimum of 34 participants would be needed. Then, the criterion sampling method was used in selecting participants. Recruitment notices were posted throughout the information boards in the university buildings to recruit individuals who met the following criteria: (1) students studying at Fujian Agriculture and Forestry University (FAFU); (2) voluntarily engaging in this research; (3) being mentally healthy with no history of neurological or mental disorders; (4) no diagnosis of a reaction to severe stress and/or depression; and (5) not suffering from drug or alcohol abuse. Based on these criteria, there were 40 volunteer university students (10 males, 30 females, mean age ± S.D. = 20.34 ± 1.43 years old, age range = 19–21 years old) from Fujian Agriculture and Forestry University (FAFU) who agreed to participate in the research. The gender distribution of this study reflects the previous research findings that women were more drawn to self-care experiential activities like forest travel than men (McEwan et al., 2021). It could be regarded to explain the greater number of female students participating than their male counterparts in this study.

Before administering the study, the participants were aware of the study's goal, methods, risks, and benefits. They signed an informed consent form and were notified that their participation was entirely voluntary and that they could withdraw at any time. In this research, all methods were performed in accordance with the relevant guidelines and regulations. Participants were asked to complete the physiological

and psychological tests before and after the forest travel activities. The participant information is given in Table 1.

All of the data were collected prior to January 2020 (the most recent data were collected on December 17, 2019), and COVID-19 had no effect on any of the activities or data collection processing. The weather on that day was cloudy without rain. The authors had been trained in the Code of Ethics of the World Medical Association, and the study was approved by the ethics committee of Fujian Agriculture and Forestry University Human Research Ethics Committee.

2.2 Study sites

The field experiment was conducted in the forested area of the Lanyuan forest, which is inside the university. The location of the field experiment in this research was shown by using the software ArcGIS 10.8. Lanyuan is a typical subtropical laurel forest zone. It is a 10-min walk for FAFU students, who can go there anytime. Despite its proximity to a learning building, this forest footpath is nearly isolated. The study area was a suitable place for conducting forest activities in terms of accessibility, distribution of a variety of vegetation, and gentle slope. The whole distance of the forest footpath is 1.5 km, and the forest travel activities experience route is shown in Figure 1.

Since the environmental situation might influence one's psychological status, environmental information was collected in this study. The environmental data for the forest travel activities in Lanyuan forest were gathered on December 17, 2019 and presented in Table 2.

The forest therapy experiment in this study was operated during the daytime. The illumination was between 238.75–1377.00 LUX. During the forest therapy experiment, the weather was cloudy without rain. The temperature range in the Lanyuan forest travel footpath was about 16–21°C, and the humidity was about 64.9–98.9. Besides, Table 2 shows that the carbon dioxide (CO_2) was lower on the main footpath (381–482 ppm), and the concentration of anions was about 1,850/cm^3–4,090/cm^3. According to the air quality standard in World Health Organization global air quality guidelines (World Health Organization, 2021), the data indicated that the air was between "clean" and "very clean." Overall, the environmental situation was comfortable for the participants.

TABLE 1 Socio-demographic distributions of the experience of Lanyuan Forest Footpath in FAFU.

General information	Items	Number	Percentage (%)
Gender	Male	10	25
	Female	30	75
Discipline	Natural science	14	35
	Social science	26	65
Exercise habit	No	16	40
	Yes	24	60
Smoking habit	No	38	95
	Yes	2	5
Drinking habit	No	36	90
	Yes	4	10

2.3 Study materials

The study materials to detect environmental information included an anion concentration detector (type: KEC900+, provided by I-Tse Co., Shanghai), CO_2, temperature, and humidity detector (type: 77535, provided by I-Tse Co., Shanghai), and a digital illumination detector (type: DT1332A, provided by I-Tse Co., Shanghai).

There were both physiological and psychological tests adopted in this study. The physiological material is the Heart Rate Variability (HRV) dynamic electrocardiogram (type: XAB-M3AG, provided by Yocaly Co., Shanghai). This device could collect three-lead electrocardiography (ECG) from the ventricle and transfer the self-calculated data to an Excel spreadsheet. The data could show information on pulse, standard deviation of the Average NN intervals (SDANN), Low-Frequency (LF), High-Frequency (HF), and Low-Frequency/High-Frequency (LF/HF) ratios. The lower pulse rate and SDANN indicate lower stress levels (Li et al., 2008; Rosenberg et al., 2017; Chen et al., 2020), while the lower LF/HF ratio indicates lower stress levels (Malik, 1996; Reed et al., 2005; Rosenberg et al., 2017).

The psychological tests included the Brief Profile of Mood State (BPOMS) questionnaire and the State–Trait Anxiety Inventory (STAI-S) questionnaire (Yu et al., 2017; Furuyashiki et al., 2019; Lee et al., 2019). Both BPOMS and STAI-S questionnaires were used in the Chinese version. In detail, the BPOMS questionnaire includes six subscales: tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, confusion-bewilderment, and vigor-activity. Each subscale in this BPOMS questionnaire includes five items. The BPOMS questionnaire was translated by Chen et al. (2002), which had an alpha coefficient of six mood states ranging from 0.98 to 0.99 (Chen et al., 2002). In there, the Cronbach's alpha coefficient for each mood state, including Tension-anxiety, Depression-dejection, and Fatigue-inertia, is 0.99. For other mood states, including Anger-hostility, Vigor-activity, and Confusion-bewilderment, the Cronbach's alpha coefficient are 0.98. The STAI-S questionnaire includes 20 items, which were translated by Shek which had an alpha coefficient of 0.90 (Shek, 1988). Lower scores on specific items within BPOMS and STAI-S questionnaires are linked to lower stress levels (Yu et al., 2017; Furuyashiki et al., 2019; Lee et al., 2019).

2.4 Study procedure

This study investigated the suitable forest locations from July 2018 to February 2019 and confirmed the forest travel activities route in March 2019. Then, participants were recruited from April to November 2019. The experiment was executed on December 7, 2019. Before the forest travel activities experiment, all participants were asked to complete all the tests as the pre-test. Then, a 2.5-h forest travel activities experience was guided by a forest therapist. There were four sessions in the forest travel activities experience which involved "listening to the forest," "touching trees and clearing the mind," "seeing the forest by mind vision," and "forest aromatherapy." The details for the four sessions of the forest travel activities experience (see Table 3) are based on the references about meditation (Thich and Aitken, 2011; Thich and Katherine, 2017) and forest travel activities (Clifford, 2021), which were revised to be suitable for this study. After the forest travel activities experiment, participants needed to complete all tests as a post-test. The procedure information is given in Figure 2.

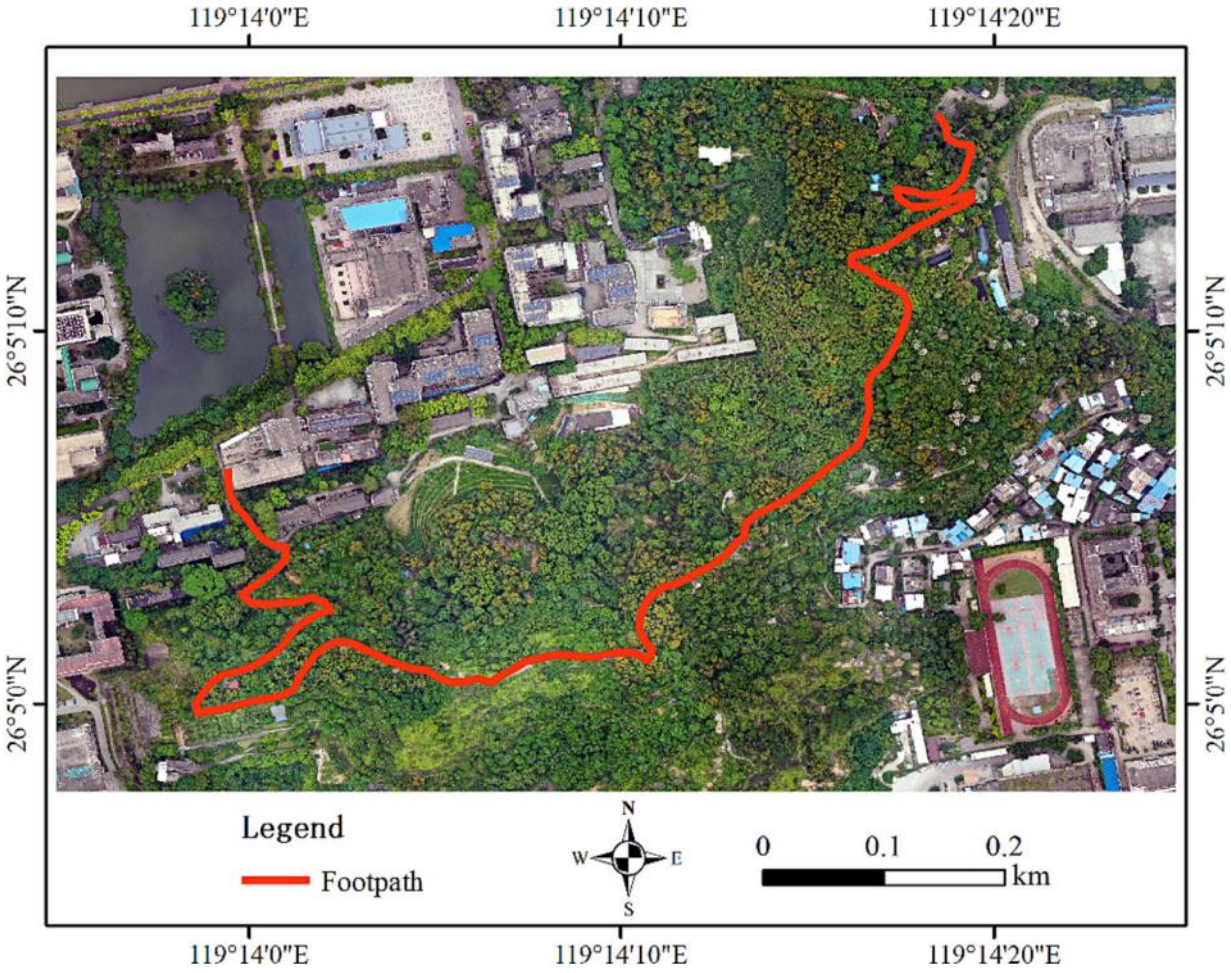

FIGURE 1
Forest travel activities experience route in Lanyuan forest travel footpath.

TABLE 2 Environmental information of Lanyuan forest travel footpath during the forest travel activities experiment.

Location description	Anion (cm^{-3})	Illumination (LUX)	Carbon dioxide (ppm)	Temperature (°C)	Humidity (%)
Starting point	1,900	238.75	399	16.1	90.5
Lanyuan auditory course	2,970	456.75	437	16.2	96.7
Rest 1	3,390	1377.00	403	15.8	98.9
Visual perception course	2,380	311.50	385	16.3	90.3
Rest 2	4,090	305.50	482	18.5	82.1
Blindfold tactile course	2,500	511.50	381	20.2	75.3
Forest fragrance course	1,850	306.00	387	21.8	64.9
Destination	2,040	416.25	386	19.2	76.1

2.5 Data analysis

The statistics from the participants, such as BPOMS, STAI-S, and HRV, were analyzed by SPSS Statistics 27.0. Descriptive statistics comprise mean, standard deviations frequency and percentage to present demographic information of participants and outcome variables. Furthermore, a paired-sample *t*-test (*t*-test) was conducted to compare participants' physical and psychological responses before and after attending the forest travel activities. All statistical tests used a *p*-value of < 0.05 as the significance level. Additionally, Cohen's d also was calculated for each dimension to measure the size of the effect of the significant differences between the pre-test and the post-test.

3 Results

This study explored the effects of short-term forest travel activities on decreasing university students' stress levels by analyzing the

TABLE 3 Details of four sessions of forest travel activities.

Period (minutes)	Content of significant activities in forest travel activities
Session 1: Listening to the forest	
	Step 1: Make your way into the forest
15	- Select a comfortable position - Breathe deeply and exhale slowly. Take note of the color, trees, and aroma of the forest at the outset
	Step 2: Walk in the forest
30	- Be kind to yourself and stroll; do not hurry - Pay attention to everything that comes into your lines of vision, such as the light beaming through the trees, the color of the leaves and flowers, the sounds made by birds, insects, or the wind, the perfume of the trees and land, and the feel and taste of the pure air in the forest
15	- Practice walking meditation. Only pay attention to how you walk and how you breathe - Concentrate on the present moment while walking; do not concentrate on the past or the future - Make the connection between breath and step
	Step 3: Develop a relationship with nature
30	- Find a quiet place to sit for at least 20–25 min - Maintain silence when observing the natural world around you - Use some words to express your current feelings and situation
15	- Share your ideas with others while calmly listening to other people's ideas (do not judge or make noise at this time) - Listen to verses for mindful walking
	Step 4: Complete the session
30	- Stroll, pay attention to the breath
15	- Drink tea and relax - Discuss with the forest therapist (optional)
Session 2: Touching trees and clearing the mind	
15	Step 1: Make your way into the forest—the same as step 1 (session 1)
45	Step 2: Walk in the forest—the same as step 2 (session 1)
	Step 3: Develop a relationship with nature
30	- Find a quiet place to sit for at least 20–25 min - Maintain silence, close your eyes, and listen to the sounds in the forest - Recognize the sounds you heard in this space
15	- Share your ideas with others while calmly listening to other people's ideas (do not judge or make noise at this time) - Listen to verses for our breath
45	Step 4: Complete the session—the same as step 4 (session 1)
Session 3: Seeing the forest by mind vision	
15	Step 1: Make your way into the forest—the same as step 1 (session 1)
45	Step 2: Walk in the forest—the same as step 2 (session 1)
	Step 3: Develop a relationship with nature
30	- Locate a tree that is both convenient and unlikely to hurt you - Gently touch this tree to feel the smoothness or roughness of the stem or leaves - Close your eyes and lie back against the tree, hugging it. Put your ear to the stem and listen to the tree's "breath" (optional) - Choose a comfortable activity interaction between you and the tree and hold it for 25 min
15	- Share your ideas with others while calmly listening to other people's ideas (do not judge or make noise at this time) - Discuss the importance of forests
45	Step 4: Complete the session—the same as step 4 (session 1)
Session 4: Forest aromatherapy	
15	Step 1: Make your way into the forest—the same step 1 (session 1)
45	Step 2: Walk in the forest—the same step 2 (session 1)
	Step 3: Develop a relationship with nature
30	- Find a quiet place to sit for at least 20–25 min - Maintain silence and pay attention to the breath - Recognize the sounds, scents, and sensations inside and outside of you
15	- Share your ideas with others while calmly listening to other people's ideas (do not judge or make noise at this time) - Listen to awareness of the body and the breath
45	Step 4: Complete the session—the same as step 4 (session 1)

physiological data (HRV) and the psychological data (BPOMS and STAI-S).

3.1 Physiological data

The HRV data could be divided into pulse rate, SDANN, LF, HF, and LF/HF ratios (Li et al., 2008; Rosenberg et al., 2017). The pulse rate indicated the wave frequency of blood flooding. A lower pulse rate reflects lower stress levels (Rosenberg et al., 2017; Chen et al., 2020). The SDANN is the standard deviation of the average NN intervals in around 5 min. The SDANN data could reflect the dysautonomia activity. Lower SDANN data indicated lower stress levels (Chen et al., 2020). Besides, LF and HF are indices that reflect HRV. LF and HF are always opposite; when people feel nervous or stressed, their LF will increase while their HF will decrease, and vice versa (Rosenberg et al., 2017). Previous studies suggested that the LF/HF ratio could be an indicator to detect stress levels, where a lower LF/HF ratio indicates lower stress levels (Malik, 1996; Reed et al., 2005; Rosenberg et al., 2017). This study applied a paired-sample *t*-test to determine the differences between the pre-test and post-test regarding university students' physiological health on stress affection.

The pulse rate, SDANN, LF, HF, and LF/HF ratio data analyses are shown in Table 4.

The results in Table 4 illustrate that the participants showed significantly lower SDANN in the post-test ($M = 24.91$, SD = 7.21) than in the pre-test test ($M = 34.91$, SD = 15.43) with t (40) = 3.31, $p < 0.01$. Moreover, the participants presented significantly lower LF/HF ratios in the post-test ($M = 2.67$, SD = 2.46) than in the pre-test ($M = 3.10$, SD = 2.06) with t (40) = 2.14, $p < 0.05$. Although the participants' pulse rate and LF data did not reach significant differences between the post-test score and the pre-test score ($t = 0.23$ and $t = 0.16$, respectively; $p > 0.05$), they all decreased slightly from the pre-test to the post-test. These data meant that the forest travel activities had a positive effect on the stress response of university students in this study, which helped decrease their stress levels.

Besides the significant differences, this study also calculated how big those differences were by Cohen's d (see Figure 3).

Regarding the effect sizes, Figure 3 shows that Cohen's d of physiological indices had good effect sizes, ranging from 0.66 to 0.83. Noticeably, the average SDANN score received in the post-test was 0.83 standard deviations lower than the average SDANN score received in the pre-test (Cohen's d = 0.83), which had a large effect on decreasing students' stress levels. Following this tendency, the effect sizes of HF and LF/HF were medium at 0.66 and 0.69, respectively. These results additionally confirmed the positive effect of short forest travel activities on the nervous or stress levels of university students.

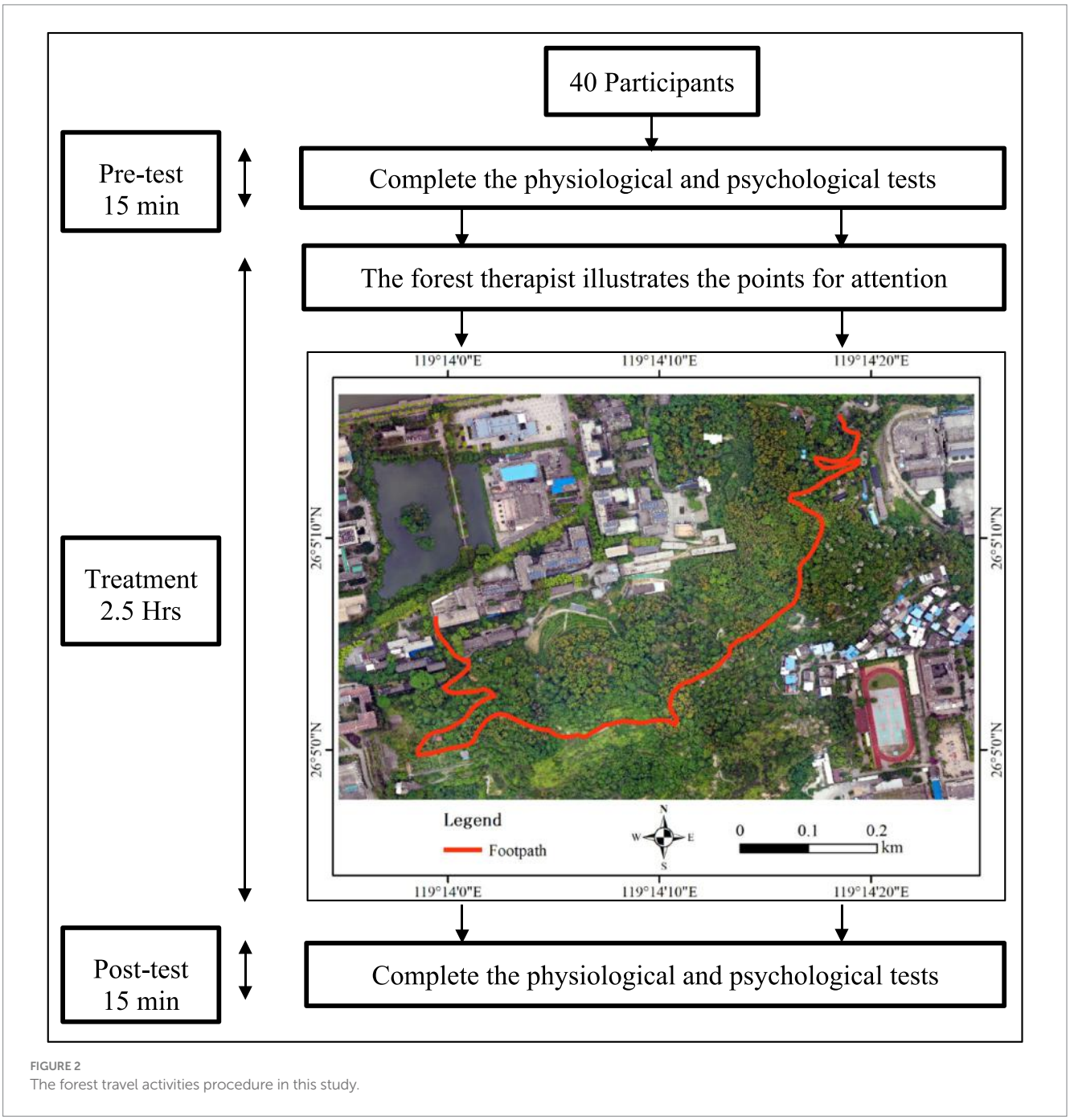

FIGURE 2
The forest travel activities procedure in this study.

3.2 Psychological data

The psychological data could be divided into BPOMS and STAI-S. The BPOMS variable includes six subscales, in which the lower scores mean lower stress levels. The STAI-S variable indicated the level of anxiety (Furuyashiki et al., 2019). Lower STAI-S data means lower stress levels (Furuyashiki et al., 2019). This study employed a paired-sample *t*-test to examine the differences in university students' psychological health related to stress between the pre-test and post-test phases. The results from the BPOMS and STAI-S questionnaires are shown in Table 5.

The results of Table 5 show that almost all data from all domains of the BPOMS and STAI-S questionnaires were significantly different from the pre-test to the post-test. In more detail, five in six subscales of the BPOMS data (tension-anxiety, depression-dejection; anger-hostility; fatigue-inertia; confusion-bewilderment) showed significantly lower scores in the post-test ($M = 1.19 \sim 3.60$, SD = 2.37 ~ 3.50) than in the pre-test ($M = 2.48 \sim 5.81$, SD = 2.93 ~ 3.60). Additionally, the *t*-values ranged from 2.09 to 2.92 with $0.001 < p < 0.05$, which meant a statistically significant decrease between the post-test and pre-test regarding the students' stress levels. In contrast, the only data that showed a significant increase in the post-test ($M = 11.90$, SD = 4.76) compared to the pre-test ($M = 9.88$, SD = 2.74) is the vigor-activity subscale.

In terms of the STAI-S data, Table 5 shows that participants scored significantly lower State-anxiety in the post-test ($M = 34.21$, SD = 8.77) than in the pre-test ($M = 40.86$, SD = 7.44) with $t(40) = 3.14$, $p < 0.001$. These results meant that the short forest travel activities had a positive effect on the psychological health of university students in this study, which helped decrease their stress levels. Besides the significant changes in the psychological data, this study also showed how big those changes were by Cohen's d (see Figure 4).

The results in Figure 4 showed that Cohen's d of psychological indices had quite good effect sizes, ranging from 0.45 to 0.82. However, the STAI-S effect could be stronger than the BPOMS effect on university students' stress affection. In particular, the effect size of STAI-S data was large at 0.82, while the effect sizes of six subscales in BPOMS data were small and medium levels with Cohen's d ranging from 0.45 to 0.64. Although the different levels of effect sizes, these results presented the positive effect of forest travel activities on the stress affection of university students.

4 Discussion

This study explored the impact of short-term forest travel activities on university students' stress, employing a comprehensive analysis of physiological and psychological indicators. The results indicate a noteworthy reduction in stress levels among participants, offering insights into the potential benefits of nature-based interventions for university students.

TABLE 4 Participants' pre- and post-physiological data.

Physiological indices	Pre-test	Post-test	*t*-value	*p*-value
Pulse rate (bpm)	88.23 ± 7.92	87.95 ± 6.77	0.23	0.823
SDANN (ms)	34.91 ± 15.43	24.91 ± 7.21	3.31	0.003**
LF (ms^2)	767.32 ± 319.21	756.27 ± 318.69	0.16	0.877
HF (ms^2)	210.91 ± 169.87	320.91 ± 163.74	−2.54	0.019*
LF/HF	3.10 ± 2.06	2.67 ± 2.46	2.14	0.045*

The physiological data, including HRV indices such as SDANN, LF, HF, LF/HF ratio, and pulse rate, consistently exhibited a trend toward reduced stress levels among participants. The significant differences in SDANN and LF/HF ratio indices indicate a positive physiological response to forest travel activities, aligning with previous research emphasizing the relaxing effects of natural environments (Malik, 1996; Reed et al., 2005; Mao et al., 2012a,b; Rosenberg et al., 2017). Although a lower pulse rate is a sign of relaxation, exercise or emotions could easily influence it. Therefore, the accuracy of the pulse rate index should warrant cautious interpretation (Shi et al., 2017; Blasé and Waning, 2019). Moreover, the psychological data, including BPOMS and STAI-S, complement the physiological results by providing insights into the participants' emotional and mental states. The significant reductions in tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, confusion-bewilderment, and state-anxiety, along with an increase in vigor-activity, point toward a notable improvement in overall psychological health among the participants. This is similar to previous research demonstrating that walking in natural environments such as natural forests, forests in urban areas, or on-campus helps reduce stress (Mao et al., 2012a,b; Norimasa et al., 2014; Jamali et al., 2020).

Our findings resonate with prior studies that have demonstrated the stress-reducing potential of forest travel activities (Li et al., 2021). However, most previous studies found that forest travel activities could decrease the stress levels of elderly people (Malik, 1996; Yu et al., 2017) and adults (18 years or older) with pre-hypertension or hypertension (Yau and Loke, 2020). Notably, the effects observed in this study are pertinent to a younger demographic—university students—extending the applicability of forest travel activities to a population commonly exposed to academic pressures and mental health challenges (Malik, 1996; Furuyashiki et al., 2019). In our investigation involving university students, we observed a modest 1% decrease in post-test heart rate, accompanied by a notable 50% increase in HF power compared to the pre-test. Conversely, studies conducted with elderly participants in Finland and Japan revealed more remarkable changes, indicating a higher reduction in heart rates (from 3.5 to 5.4%) and a twofold increase in HF power during forest walking and viewing (Yau and Loke, 2020). Moreover, our study showed significant reductions in some mood states, along with an increase in vigor-activity among university students, aligning with previous research involving elderly participants (Yu et al., 2017). However, the Cohen's d effect sizes of the changes in our study appear to be less than those in a previous study on the effects of forest travel activities on the elderly (ranging from 0.68 to 1.08) (Yu et al., 2017), with ours ranging from 0.45 to 0.82. While both age groups experienced positive outcomes, these variations suggest potential differences in the benefits of forest travel activities between younger and older populations.

The findings presented in this study have important implications, particularly in the context of university students' health. University life is often characterized by high levels of academic pressure, social demands, and mental health challenges (Craggs, 2012; Downs and Eisenberg, 2012; Schwartz et al., 2021). The positive effects observed in both physiological and psychological data suggest that short-term forest travel activities can serve as an effective intervention for mitigating stress among university students.

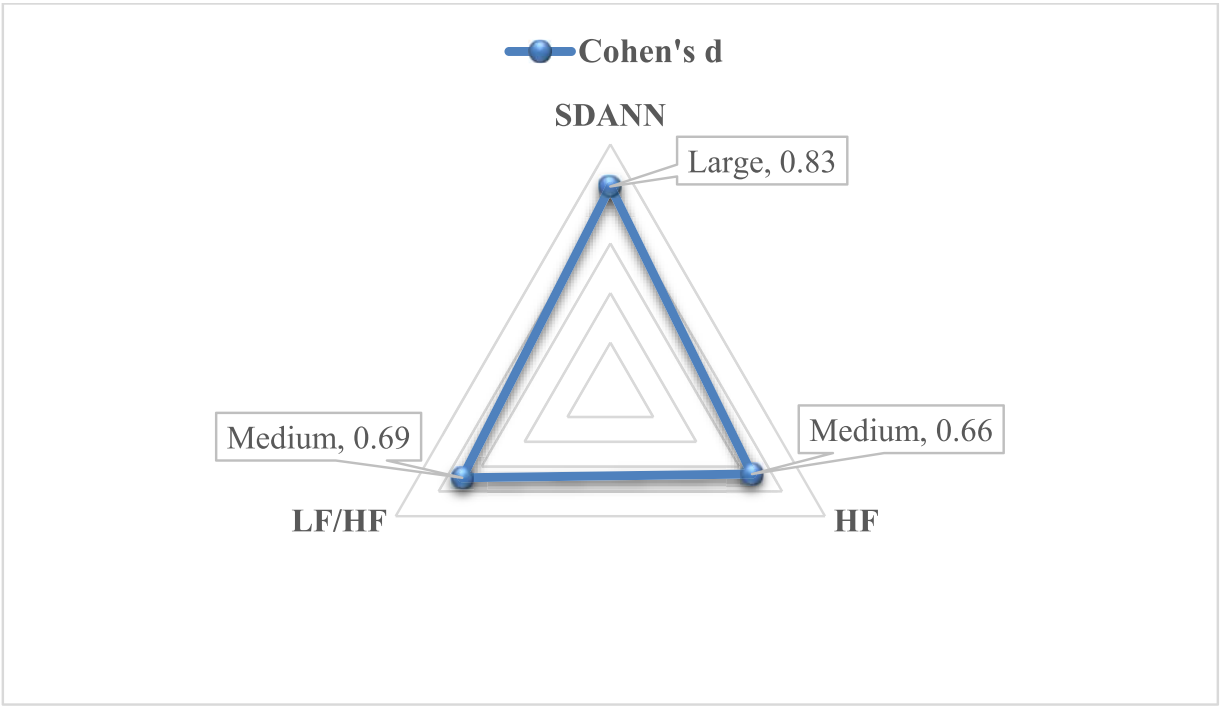

FIGURE 3
The effect size of the short forest travel activities on physiological indices.

TABLE 5 Participants' pre- and post-psychological data.

Variables	Subscales	Pre-test	Post-test	*t*-value	*p*-value
Emotional states (BPOMS)	Tension-anxiety	2.95 ± 2.93	1.74 ± 2.37	2.09	0.040*
	Depression-dejection	2.48 ± 2.94	1.19 ± 2.43	2.18	0.032*
	Anger-hostility	5.81 ± 3.45	3.60 ± 3.50	2.92	0.004**
	Fatigue-inertia	3.12 ± 3.60	1.60 ± 2.63	2.22	0.029*
	Confusion-bewilderment	3.95 ± 2.78	2.45 ± 2.46	2.62	0.010*
	Vigor-activity	9.88 ± 2.74	11.90 ± 4.76	−2.39	0.020*
Anxiety (STAI-S)	State-anxiety	40.86 ± 7.44	34.21 ± 8.77	3.74	0.000***

The practical applications of these findings are twofold. Firstly, universities and educational institutions can consider integrating short-term forest travel activities into their student well-being programs. These activities, even when conducted over a brief period, have demonstrated the potential to alleviate stress and improve mental and physiological health. Such interventions could be particularly beneficial during stressful academic periods or as part of a broader strategy to support student mental health. Secondly, policymakers and urban planners should take note of the potential benefits of preserving or creating urban green spaces and forests. These natural environments can serve as accessible and cost-effective tools for promoting mental and physiological health among diverse populations, including university students.

However, it is important to acknowledge the study's limitations. Since different forests might produce different concentrations of anions and varying components of phytoncides, the inferences drawn from the results should be made carefully. Therefore, it is necessary to carry out the following studies on the forests with different properties to test variables of forest properties affecting stress affection through forest travel activities. Moreover, to enhance the robustness of future studies, it is crucial to implement controls for factors such as individual variations in stress susceptibility, pre-existing health conditions, and lifestyle factors. Especially, because women were more drawn to self-care experiential activities like forest travel than men (McEwan et al., 2021), future research should consider incorporating gender-specific controls to better understand potential variations in responses to forest interventions. Furthermore, the absence of a control group is also a limitation. The inclusion of a control group would allow for a more comprehensive assessment of the unique contributions of the forest traveling activities. This would help isolate the effects of natural exposure from other potential influencing variables. Additionally, while some indices demonstrated substantial effect sizes, others yielded smaller or medium effects, suggesting the need for larger sample sizes in future studies. Especially, the effectiveness of mindfulness exercises and the influence of the forest environment remain uncertain. Lastly, as each physiological material has its own mechanical limitations, it is also a kind of limitation of this study.

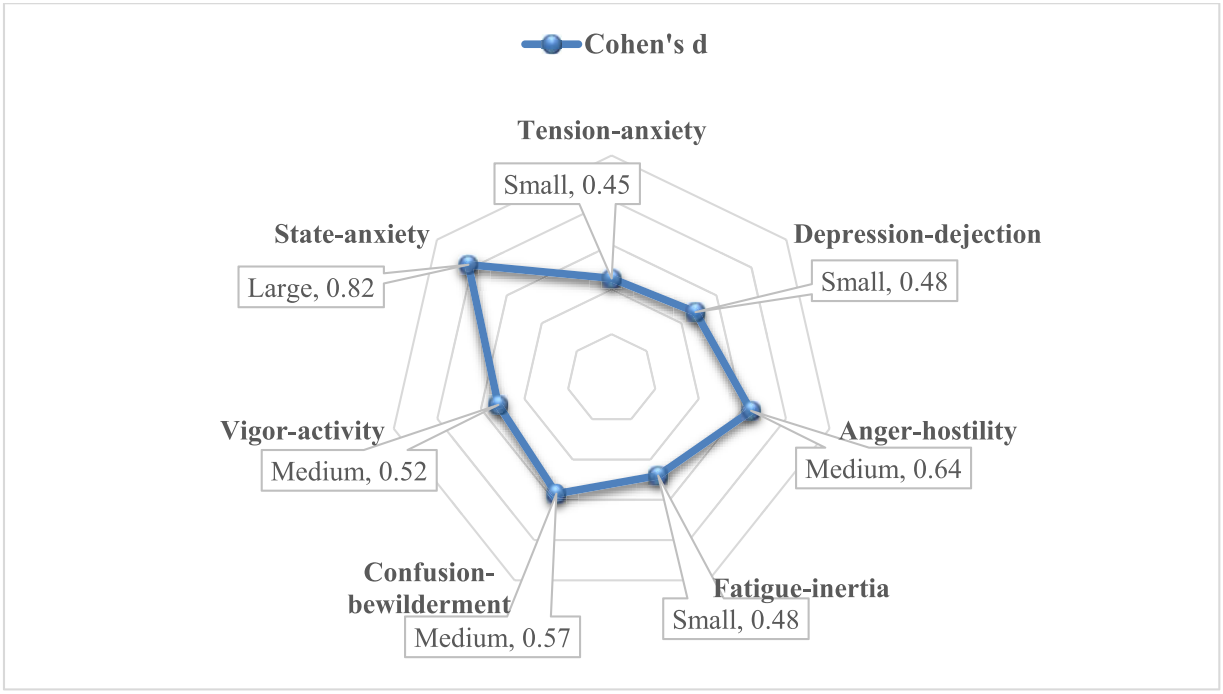

FIGURE 4
The effect size of the short forest travel activities on psychological indices.

5 Conclusion

In this study, we investigated the impact of short-term forest travel activities on reducing stress levels among university students through a comprehensive analysis of physiological and psychological data. The primary findings of this study clearly demonstrate the substantial positive impact of short-term forest travel activities on reducing stress levels among university students. Both physiological measures, encompassing HRV indices and pulse rate, and psychological assessments, including mood and anxiety scales, consistently showed significant improvements post-forest travel.

Our research advances current knowledge by providing evidence of the effectiveness of short-term forest travel activities in reducing stress among university students. This study contributes to the literature on the benefits of nature exposure, particularly among younger populations. In the broader context, this study not only confirms the positive impact of short-term forest travel activities on university students' stress levels but also highlights the practical applications of this knowledge. It encourages the integration of nature-based interventions in university well-being programs and underscores the significance of green spaces in urban planning. By bridging the gap between research and practice, this study contributes to the improvement of student's health and more sustainable cities. It is our hope that these findings will inspire further research and policy changes that prioritize the health of individuals and communities through their connection with the natural world.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Fujian Agriculture and Forestry University Human Research Ethics Committee. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

This study was planned by W-YC, XW, and C-FH. The study was conceptualized and designed by W-YC, L-H-PN, N-HT, H-CW, and C-FH. The collection and analysis of data was organized by XW, S-JY, D-SG, and H-ZL. The first draft of the manuscript was written by W-YC. All authors reviewed and developed to previous versions of the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Research Proposal

Elderly Tango Therapy in the Taromak Drekay Indigenous Community: An EEG-Based Study on Cognitive and Emotional Benefits

Chinfei Huang, Weihsuan Lin

1. Introduction and Rationale

Population aging is a global phenomenon, and Taiwan has officially entered a super-aged society. One of the most pressing challenges is to design culturally relevant, evidence-based interventions that support older adults' cognitive, emotional, and social well-being. Dance therapy has emerged as a promising approach for elderly care, particularly Argentine Tango, which combines structured movement, musicality, interpersonal connection, and emotional expression.

Since 2014, our team has accumulated more than a decade of tango experience, including five intensive learning journeys to Argentina and professional training under tango maestro Eric Dinzel. In 2024, we initiated a pilot project adapting tango for older adults ("Elderly Tango") and implemented it at the Taromak Cultural Health Station, serving the Drekay Indigenous community in Taitung, Taiwan. The pilot demonstrated highly positive feedback: elders expressed gratitude, collectively decided to continue tango after ten weeks, caregivers requested ongoing visits, and supervisors observed unexpected positive responses from a dementia patient to tango music.

Building upon this foundation, the present research aims to systematically examine the neurocognitive and psychological benefits of Elderly Tango by employing **electroencephalography (EEG)**, a non-invasive brainwave measurement method. By integrating tango therapy with EEG analysis, we seek to bridge cultural practice with neuroscientific validation.

2. Literature Review

Dance Therapy and Aging. Dance interventions have been shown to improve balance, reduce fall risk, and enhance psychosocial well-being in older adults. Argentine Tango, in particular, has been associated with improvements in motor coordination, gait, and emotional regulation.

EEG and Cognitive Aging. Neuroimaging studies indicate that normal aging is associated with both functional decline and compensatory recruitment in prefrontal and parietal regions. EEG measures such as increased theta power and decreased alpha coherence have been linked to cognitive decline, while enhanced frontal alpha and beta activity may signal compensatory mechanisms (see *Age-related changes of task-specific brain activity in normal aging*).

EEG and Psychophysiology of Music/Dance. Research shows that natural environments, music, and embodied movement elevate alpha activity, associated with relaxation and creativity, and theta rhythms, associated with memory and attentional engagement. These markers provide quantifiable indices of stress reduction and cognitive stimulation.

Indigenous Context. Few studies have examined dance therapy in Indigenous settings. By integrating Drekay music and dance elements into Elderly Tango, the intervention can achieve greater cultural resonance, promoting identity, continuity, and intergenerational connection.

3. Research Objectives

1. **Neurocognitive Impact:** To evaluate whether participation in Elderly Tango increases alpha and theta power in EEG recordings, reflecting relaxation, attention, and cognitive activation.
2. **Psychological Well-being:** To assess reductions in self-reported loneliness, anxiety, and stress, and improvements in positive affect and social connectedness.
3. **Cultural Integration:** To explore how incorporating Drekay traditional music and movement into tango enhances acceptance, engagement, and therapeutic outcomes.
4. **Scientific Contribution:** To contribute to the emerging field of therapeutic tango and establish an evidence base linking dance therapy, brain activity, and Indigenous elder care.

4. Methodology

4.1 Participants

- **Sample:** 30 older adults (aged 65+) enrolled at the Taromak Cultural Health Station, including both cognitively healthy elders and those with mild cognitive impairment.
- **Inclusion Criteria:** Regular attendance at the Health Station, willingness to participate, ability to walk with or without support.
- **Exclusion Criteria:** Severe neurological or psychiatric illness, inability to give consent.

4.2 Intervention Design

- **Duration:** 12 weeks, two sessions per week, 60 minutes each.
- **Structure:**
    - Warm-up with breathing and stretching (10 min)
    - Tango-based movement adapted for elders (30 min)
    - Integration of Drekay songs and simple traditional steps with tango rhythm (15 min)
    - Group reflection and relaxation (5 min)
- **Facilitators:** University-trained tango instructors and student assistants, supervised by certified dance therapy trainers.

4.3 EEG Measurement

- **Device:** Portable wireless EEG headset (e.g., 14–32 channel system).
- **Procedure:**
    - Baseline resting-state EEG (eyes closed, 5 min)
    - EEG during tango movement (with music, partner interaction)
    - Post-session resting-state EEG
- **Data Analysis:**
    - Power spectral density analysis of alpha (8–12 Hz), theta (4–7 Hz), and beta (13–30 Hz) bands.
    - Comparison of pre- vs. post-intervention averages.
    - Within-subject analysis across sessions to assess longitudinal changes.

4.4 Psychological and Social Measures

- **Loneliness:** UCLA Loneliness Scale
- **Anxiety/Depression:** Geriatric Anxiety Inventory (GAI), Geriatric Depression Scale (GDS)

- **Quality of Life:** WHOQOL-OLD
- **Social Engagement:** Qualitative interviews with elders, caregivers, and facilitators.

5. Expected Outcomes

1. **EEG Outcomes:** Increased alpha and theta power post-intervention, reflecting relaxation and cognitive engagement. Improved frontal coherence, suggesting enhanced attentional control.
2. **Psychological Outcomes:** Reduced loneliness, anxiety, and depressive symptoms; improved well-being and social connectedness.
3. **Cultural Impact:** Higher engagement and satisfaction among elders when tango integrates Drekay music and movement.
4. **Scientific Value:** Contribution to cross-cultural dance therapy research; validation of tango as a neurocognitive and psychosocial intervention.

6. International Collaboration and Future Prospects

This study will serve as the foundation for a larger international cooperation project. In 2025, our team joined the **Taiwan Dance Therapy Association** and received training in **Therapeutic Tango** at the University of Burgundy, France. A new Memorandum of Understanding (MOU) with the University of Burgundy is under preparation, with plans to jointly apply for an **EU Cooperation Partnerships grant in March 2026**.

Future collaboration will involve psychologists and neuroscience teams specializing in EEG and stress biomarkers, allowing for a multi-disciplinary evaluation of the therapeutic impact of Elderly Tango in Indigenous contexts. This integration of Argentine Tango, Drekay cultural elements, and neuroscientific assessment will create a unique, globally relevant model of culturally grounded elderly care.

7. Conclusion

The proposed study aims to pioneer an innovative model of elder care at the Taromak Cultural Health Station, combining **therapeutic tango, Drekay cultural expression, and EEG-based neuroscientific validation**. By bridging global practices with local traditions, the project addresses cognitive decline, loneliness, and emotional health in older adults while promoting cultural resilience.

Beyond its local significance, the study will contribute to international discourse on aging, dance therapy, and the intersection of culture and neuroscience.

Tango Therapy in Taiwan's Community Health Stations: Enhancing Well-Being, Self-Efficacy, and Social Support in Older Adults

Yung-Chen Kuo

1. Background

In an aging society, older adults often face loneliness and psychological stress due to retirement, physical limitations, and shrinking social networks. Dance activities have been shown to improve physical function while also supporting emotional regulation and social connectedness, offering a holistic approach to healthy aging (Keogh et al., 2009).

Among these, Tango therapy has gained attention as a therapeutic intervention, particularly for Parkinson's disease (PD). Evidence indicates that tango improves balance, gait, and health-related quality of life (Hackney & Earhart, 2009a), enhances spatial cognition and reduces disease severity (McKee & Hackney, 2013), and promotes gait, balance, and social participation in community-based programs (Duncan & Earhart, 2014). Partnered tango is also reported as more enjoyable and motivating, strengthening adherence even when functional gains are similar to non-partnered forms (Hackney & Earhart, 2009b).

While robust evidence supports tango's physical and cognitive benefits, psychological and social outcomes—such as loneliness, self-efficacy, and well-being—remain underexplored. This gap is critical, as loneliness is a major risk factor for mental health decline in older adults (Holt-Lunstad et al., 2015).

Therefore, this study seeks to address the underexplored psychosocial dimension of tango therapy, investigating its potential to enhance well-being, strengthen self-efficacy, and reduce loneliness among older adults in Taiwan's community health stations.

2. Objectives

To evaluate the impact of tango classes on positive emotions and well-being.

To explore how leader–follower role shifts enhance self-efficacy and empowerment.

To assess tango's role in fostering social support and reducing loneliness.

3. Methods

Participants
20–30 older adults (aged 60+) with basic walking ability, recruited from community health centers.

Design

An 8-week Argentine Tango program, with weekly 120-minute sessions.

Program Content

Warm-up: breathing and simple walking exercises.

Core: weight shifting, *ocho* (figure-eight steps), and role switching (leader/follower).

Closing: slow walking, relaxation, and group sharing.

Data Collection

Quantitative: Short pre- and post-program questionnaires (5-point Likert scale, 8–10 items) covering:

Emotional well-being (e.g., "I feel better after the class").

Self-efficacy/empowerment (e.g., "I feel I can lead or influence my partner").

Social support & loneliness (e.g., "I feel supported and less alone in class").

Qualitative: Semi-structured interviews (20–30 minutes) after program completion, using a conversational approach to collect reflections on emotions, empowerment, and social connectedness.

Data Analysis

Quantitative: Paired-sample *t*-tests or Wilcoxon signed-rank tests to compare pre- and post-test scores, with calculation of effect sizes (Cohen's *d*).

Qualitative: Thematic analysis to identify major themes (e.g., joy, confidence, support).

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Using Senior Tango Dance to Enhance Elderly Physical Fitness and Mental Health

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1. Abstract

This study examines methods for enhancing health and social engagement in response to Taiwan's imminent transition into a super-aged society, focusing specifically on the use of senior tango to improve the health and social interactions of elderly individuals. As the population aged 65 and above continues to grow, Taiwan is encountering increasing demands from its elderly citizens. In response, the Executive Yuan has revised the White Paper on Aging Society, proposing five major objectives to promote elderly health, autonomy, and social connectivity. Studies indicate that participating in dynamic leisure activities such as dance can effectively enhance muscle endurance, balance, and social relationships among the elderly while preventing chronic diseases and improving their overall quality of life. Through tango activities, participants not only experience improvements in physical health but also gain self-confidence and enhanced interpersonal relationships.

This study, titled "Using Senior Tango Dance to Enhance Elderly Physical Fitness and Mental Health," applies the principles of Argentine tango, which has been listed as a UNESCO cultural heritage, to design a program that includes warm-up activities suitable for the elderly and a 12-week senior tango course. The effectiveness of this program will be evaluated through physical fitness measurements, interviews, and observational analysis, providing insights into future directions for improving elderly social engagement and health. Although tango communities exist in major metropolitan areas such as Taipei, Taichung, and Kaohsiung, no initiatives have yet been undertaken to incorporate tango into elderly health promotion activities or to conduct relevant studies in Taiwan. Consequently, this research holds significant practical and innovative value in addressing the challenges of an aging society.

2. Research Background and Motivation

On an international scale, the proportion of the population aged 65 and above is a standard metric for measuring demographic aging. A society is classified as "aging" when this proportion surpasses 7%, "aged" when it exceeds 14%, and "super-aged" when it exceeds 20% (Council for Economic Planning and Development, 2013: 27). According to projections from the National Development Council, by 2026, Taiwan's elderly population will comprise 20.8% of the total population, officially classifying Taiwan as a super-aged society according to the definition set by the United Nations. To accommodate the increasingly diverse needs of the elderly, the Executive Yuan has approved revisions to the White Paper on Aging Society and has established five major goals aimed at fostering sustainable social development (Executive Yuan, 2021: 1f.):

1. Enhancing elderly health and autonomy
2. Strengthening social connections among the elderly
3. Promoting intergenerational harmony and inclusion
4. Establishing an elderly-friendly and safe environment

5. Reinforcing social sustainability

How to improve elderly health and foster social connections has become a critical issue in Taiwanese society.

2.1. Research Motivation

Regarding the health and social challenges faced by the elderly, Western studies suggest that continued participation in various activities enhances a positive self-concept and fosters interpersonal interactions, ultimately leading to higher overall life satisfaction (Havighurst, 1953). Erikson, Erikson, and Kivnick (1986) propose that artistic activities can enrich the lives of elderly individuals by providing creativity, inspiration, and novel sensory experiences that stimulate emotional expression. Research conducted by Zhang Yuan-Zhen and Su Meng-Ping (2011) suggests that musical activities positively impact the self-concept and interpersonal relationships of elderly individuals within communities. Furthermore, Western studies indicate that dance not only benefits the general elderly population but also significantly improves the gait and balance of individuals with conditions such as Parkinson's disease. These findings have contributed to the development of professional dance therapy (Li Yuan & Su Jun-Xian, 2019; Bracco et al., 2023; Fedirici, Bellagamba & Ricci, 2005; Zhang et al., 2008; Koh, Kim & Noh, 2018).

This study aims to address Taiwan's transition into a super-aged society by aligning with the Executive Yuan's objectives of "enhancing elderly health and autonomy" and "strengthening social connections among the elderly." This research examines the impact of senior tango on the health and social engagement of elderly participants at the Dalumak Cultural Health Station in Taitung County's indigenous region. Many retirees participate in leisure activities as a means of passing time, with dancing being a particularly popular option. While dynamic leisure activities provide numerous benefits—such as improving muscle endurance, balance, and reducing the risk of falls—they also present potential risks, as elderly individuals often experience degeneration in joints and muscles. Consequently, this study will implement tango activities at the Dalumak Cultural Health Station, incorporating physical fitness tests, observational analysis, and interviews to explore the effects of tango on multiple aspects of elderly well-being.

2.2 Research Scope and Limitations

This study is limited by the absence of standardized measurement tools for social engagement and well-being. The research is confined to elderly individuals at the Dalumak Cultural Health Station in Taitung County's indigenous community, meaning that the findings cannot be generalized to the broader elderly population of Taitung or Taiwan. The study participants are categorized into five age groups: 90-100 years (6-7 individuals), 80-90 years (8-9 individuals), 70-80 years (9-10 individuals), 60-70 years (6-7 individuals), and under 60 years (5-6 individuals). The implementation of the senior tango program spans 12 weeks; however, this relatively short timeframe may limit the significance of measurable outcomes. Additionally, since most participants belong to the Rukai indigenous group, variations in cultural acceptance of partner dancing may further constrain the generalizability of the study's results.

3. Literature Review

Numerous studies have shown that designing leisure activities for the elderly that integrate both entertainment and health functions not only improves their physical and mental well-

being but also enhances their sense of happiness and life satisfaction. The following literature review explores how tango can actively strengthen muscle power and balance training among the elderly. It also provides research data to substantiate the urgency of muscle and balance training for older adults. Additionally, tango is a partnered dance form, which for the elderly is not merely a physical activity but also a form of social interaction. The leader and follower in the dance must coordinate their steps, which helps improve coordination, social interaction, and self-confidence. Warm-up exercises aim to increase body temperature in preparation for physical activity. They help relax tense muscles, prepare the cardiovascular system for increased exertion, enhance physical performance, and reduce the risk of injury (Mark Williams, 2020).

3.1 Leisure Activities and Motivation for Continued Involvement Among the Elderly, and Their Well-being

After retirement, elderly individuals experience increased free time, and many choose to engage in various leisure activities to occupy themselves. Engaging in appropriate leisure activities can enhance their quality of life. Leisure activities can be categorized as either static or dynamic. According to Wei Zheng and Xia Lu-He (2014), common static leisure activities among the elderly may not necessarily be beneficial to their health. For example, watching television has been linked to increased cognitive decline. In contrast, dynamic activities are more beneficial for improving elderly individuals' physical condition, as they enhance coordination, muscular endurance, strength, and balance. These improvements contribute to better health and daily functionality. Among the elderly, "feeling happy" is the most commonly cited motivation for participating in leisure activities. Factors such as social support, social interaction, and a sense of personal accomplishment all play key roles in improving happiness and fostering a sense of joy (Wei Zheng & Xia Lu-He, 2014).

Liu Yan-Qian (2022) defines well-being as an individual’s subjective perception of overall life satisfaction and the pleasant emotions that arise from achieving personal values and beliefs. It encompasses positive emotional states without depression, anxiety, or other negative emotions. Well-being can be categorized into three aspects: emotional well-being, psychological well-being, and social well-being. Emotional well-being refers to an individual’s experience of positive and negative emotions in daily life. Psychological well-being involves achieving life goals, mental adjustment, and self-efficacy, reflecting the overall development of psychological potential. Social well-being pertains to an individual’s position and relationships within society and the environment, including their contribution to society and the degree of integration between the individual and society. The level of involvement in leisure activities is significantly correlated with well-being and life satisfaction—greater involvement leads to higher overall well-being. Encouraging elderly individuals to engage in leisure activities is an effective way to enhance their quality of life and happiness.

Another major motivation is "maintaining health." A recreational activity that incorporates both entertainment and physical exercise can effectively fulfill the needs of the elderly when selecting leisure activities. In a study by Ma Pin-Qin (2017), it was found that among dynamic leisure activities, those requiring a partner, such as badminton, folk dance, and ballroom dance, have lower participation rates compared to individual activities like walking and hiking. This lower participation rate is mainly due to the decline in the physical abilities of the elderly, as individual activities allow them to freely adjust exercise intensity according to their physical condition. Although numerous studies have demonstrated the health benefits of exercise, a significant number of elderly individuals suffer from functional decline due to aging, preventing them from achieving their recommended daily exercise requirements (Li

Yuan & Su Jun-Xian, 2019). Therefore, designing an enjoyable exercise program that allows for partner-assisted participation could motivate elderly individuals to engage in physical activity. The potential benefits of partner dances, such as tango, for elderly individuals will be explored in greater detail in Section 3.

3.2 The Importance of Strength and Balance Training for the Elderly

Traditional beliefs often suggest that as people age, they should reduce physical activity. However, recent medical literature has increasingly emphasized the importance of exercise for elderly individuals. Zhu Yi-Min (2003) states that moderate exercise can promote blood circulation, improve bodily functions, and prevent diseases. Physiological conditions such as muscle strength begin to decline gradually after the age of 45, with explosive strength decreasing even more rapidly. Statistics indicate that among healthy individuals aged 65-80, muscle strength declines by 1-2% per year, while explosive strength declines by 3-4% per year. The primary cause of muscle deterioration is a lack of physical activity (Zhu Yi-Min, 2003).

With the rise of an aging population, the proportion of elderly individuals has dramatically increased. Physical fitness is essential for maintaining health and performing everyday tasks (Zhuo Jun-Chen, 1986). Fang Jin-Long (1993) also asserts that physical fitness refers to the body's ability to effectively perform daily activities and respond to unexpected situations.

Muscle loss (sarcopenia) is one of the most significant and common problems among elderly individuals. Between the ages of 50 and 70, muscle mass decreases by approximately 8% per year (Cannataro et al., 2022). Between the ages of 50 and 85, individuals lose up to 50% of their muscle mass, mainly due to the decline of type II muscle fibers. Muscle loss associated with aging is linked to an increased risk of falls and disability, impairing the ability to perform basic daily activities (Fritzen et al., 2020). Although physiological function naturally declines with age, inactivity or a lack of muscle use is a significant contributing factor (Govindasamy & Peteron, 1994). As muscle strength and endurance deteriorate, elderly individuals may struggle with basic daily activities such as mobility and grip strength. Strength training not only helps prevent chronic diseases but also improves mental health, enhances mobility, and contributes to a better quality of life. Scientific and clinical studies have repeatedly confirmed the physical and psychological benefits of exercise, including a sense of accomplishment and independence in performing daily activities such as cooking, bathing, and climbing stairs (Li Yu-Jie, 2010).

For the elderly, balance training is also essential. Falls are a prevalent health issue among the elderly population, with a strong correlation between balance ability and fall incidence (Li Ya-Yun et al., 2006). Fall risk factors are closely associated with an elderly individual's health status, medical conditions, physical activity, and overall fitness (Pereira, Vogelaere, & Baptista, 2008). According to a 2017 National Health Interview Survey, approximately 1 in 6 individuals aged 65 and above had experienced a fall, and 1 in 12 required medical treatment for fall-related injuries. While fractures in the arm may not significantly affect mobility, falls resulting in leg injuries can have severe consequences, impacting quality of life and increasing mortality risk.

Both strength and balance training play a vital role in maintaining the health of elderly individuals. Engaging in regular exercise can mitigate age-related muscle decline and balance deterioration. Adopting health-oriented physical fitness activities allows elderly individuals to develop consistent exercise habits, reduce the incidence of chronic diseases, and decrease reliance on healthcare services, ultimately improving their overall quality of life.

3.3 Tango Therapy and Elderly Health and Social Interaction

This study will design an Argentine tango partner dance program tailored for elderly individuals to dance together. One of the primary objectives of this study is to use a partnered dance form to enhance the social frequency of older adults. For elderly individuals, friendships play the role of social activity partners, conversation companions, and more. Adams (1987) states that elderly individuals with stable and close friendships are better able to adapt to changes associated with aging and retirement. The social relationships of older adults can be examined through factors such as the number of close friends, frequency of interaction, proximity to others, and emotional support. When the social needs of older individuals are fulfilled, their overall life satisfaction significantly improves (Zhang Yuan-Zhen, 2011).

Li Yuan and Su Jun-Xian (2019) point out that in Argentine tango, there is a step that involves moving backward. When stepping backward, weight is maintained on the supporting leg, and the moving leg is dragged backward from the toes, effectively strengthening the ability to move in reverse. Since this movement differs from regular walking, it engages different small joint areas. Tango dancers generally have better balance than non-dancers. Targeted tango training can effectively improve the balance ability of elderly individuals while also increasing muscle strength. During tango practice, dancers visualize dance movements in their minds, which activates the lateral prefrontal cortex and the medial prefrontal supplementary motor area of the brain.

From a biomechanical and kinesthetic perspective, tango is a dance based on normal gait (Koh Y. et al., 2019). The changing rhythm of the music influences gait speed, compelling dancers to move within different speed ranges and continuously adjust their stride length. These characteristics make tango an excellent tool for balance and gait rehabilitation (Koh Y., Kim I.C.S., Noh G., 2018) and for preventing functional decline (McKinley P. et al., 2008).

In tango and other partner dances, the leader must constantly make anticipatory decisions, planning the next steps, while the follower must wait for the leader's cues and respond swiftly. This coordination requires the follower to complete movements in synchrony with the leader, ensuring smooth execution of the dance. This process must also align with the external rhythm of the music while dancers in a group setting remain aware of others' movements to avoid collisions and maintain coordination. These demands significantly challenge a participant's body coordination, and long-term practice can effectively enhance these abilities. For elderly individuals, partner dance is more than just an activity; it serves as a social model. Partner dance enhances social interactions among elderly individuals while also boosting their self-confidence (Li Yuan & Su Jun-Xian, 2019).

3.4 Exercise-Related Injuries and Warm-Up for the Elderly

Although exercise has many benefits for the elderly, such as strengthening the immune system, increasing resistance, and preventing osteoporosis and sarcopenia, it also carries certain risks, especially when the exercise method or intensity is inappropriate. Pre-exercise assessments and evaluations are crucial for elderly individuals to understand their movement posture and current physical condition. This ensures they engage in exercises suited to their needs while avoiding potential injuries. Zeng Feng-Jun (2023) suggests that the first step in evaluation is to consult medical history and conduct physical assessments. If an individual has pre-existing conditions or special needs, it is advisable to seek medical evaluation before exercising and receive appropriate exercise guidance.

Training goals are not necessarily correlated with body weight but should instead be determined through body composition analysis, which provides a more accurate picture of an elderly person's physical condition and helps establish phased exercise goals. These goals may include increasing muscle mass, reducing fat, or correcting muscle imbalances. The most common issues among elderly individuals are high body fat, low muscle mass, and muscle imbalance in the limbs.

The following outlines possible injuries associated with senior tango and preventive recommendations, along with preparations needed before exercise:

3.4.1 Potential Injuries and Preventive Measures:

1. **Muscle and Joint Injuries** With age, muscle mass and joint flexibility gradually decline. If elderly individuals engage in high-intensity or improper exercise, they are at risk of muscle strains, joint pain, or joint injuries, especially in weight-bearing areas such as the knees, hips, and lower back. **Preventive Measures:** Choose low-impact exercises such as walking, swimming, tai chi, or gentle tango and yoga to reduce stress on the joints. Ensure thorough warm-up exercises before engaging in physical activity, followed by stretching to help the body adapt to exercise.
2. **Fractures and Fall Risks** As bone density decreases with age, elderly individuals become more prone to osteoporosis, making bones more fragile. This increases the likelihood of falls or slips during exercise, which can result in fractures, especially if the exercise intensity is too high or movements are unstable. **Preventive Measures:** Exercise in a safe and stable environment, avoiding slippery or uneven surfaces. Engage in exercises that improve balance and coordination, such as tai chi, tango, or specialized balance training, to minimize fall risks.
3. **Psychological Stress and Discomfort** Some elderly individuals may feel discouraged if they perceive themselves as lacking physical strength or if the exercise intensity is too high. This can negatively impact their mental well-being, particularly during the initial stages of exercising or when returning to physical activity. **Preventive Measures:** Develop a personalized exercise plan based on individual ability, starting with light activities and gradually increasing intensity. Choose enjoyable exercise routines to enhance motivation. Exercising with friends or family can alleviate loneliness and provide psychological support. Since this study's tango program is designed for elderly individuals, it prioritizes simple movements before progressing to more complex partner interactions to prevent frustration.

3.4.2 Daily Training and Warm-Up

Qiu Shu-Yi (2022) states that sarcopenia and frailty syndrome are the most common aging-related conditions among elderly individuals. Many seniors experience muscle atrophy in the lower limbs, leading to slower walking speed and difficulty standing for extended periods. These symptoms of frailty and sarcopenia often lead to disability, falls, and injuries. "Prevention is the best medical solution," and early attention and intervention are key to preventing frailty and sarcopenia.

Encouraging elderly individuals to use household items for exercise, such as a chair for support, can facilitate safe movement. Based on recommendations from Taiwan's Health Promotion Administration, this study has compiled five fundamental training exercises suitable for warm-up in senior tango. These exercises aim to improve muscle strength and balance and can be incorporated into daily routines:

1. **Marching in Place:** Alternately step with each foot, using a stepping motion to maintain basic muscular endurance and cardiovascular fitness.
2. **Squatting Like Sitting:** Stand with feet shoulder-width apart, keeping the back straight. Avoid shifting the hips too far forward. When squatting, look forward and keep the back upright. This exercise strengthens leg muscles, endurance, and balance.
3. **High Knee Step on Stairs:** Raise one leg and the opposite arm simultaneously while keeping the other foot firmly planted. Alternate sides to strengthen leg muscles and enhance stability.
4. **Heel Raises for Balance:** Hold onto the back of a chair and rise onto the toes, slightly lifting the heels. Keep the back straight to strengthen the calf muscles and improve balance.
5. **Lunges for Leg Strength:** Step one foot forward, shifting weight onto the front leg while keeping the back straight. Bend both knees at 90-degree angles before switching sides. This exercise develops leg strength, endurance, and stability.

4. Research Methods and Procedures

This study aims to design a tango dance program suitable for elderly individuals while also developing appropriate warm-up exercises to prevent exercise-related injuries. The activity plan consists of two-hour sessions per week, spanning a total of 12 weeks. The primary objective is to enhance the physical fitness of elderly individuals, particularly their leg strength and balance. Additionally, pre- and post-program physical fitness assessments will be conducted to evaluate the impact of senior tango on improving the strength and balance of elderly participants. Furthermore, this study will employ semi-structured interviews and observational methods to analyze whether senior tango contributes to improving the social relationships of elderly individuals, fostering emotional communication and social interaction.

This study conducted preliminary discussions with the caregivers at the Dalumak Elderly Care Cultural Health Station in the indigenous area regarding the activity planning. The caregivers expressed a strong need for new programs for the elderly at the station and showed great enthusiasm for the implementation of a 12-session senior tango program (see Figure 1 and 2).


Figure 1 and 2: The research team introducing tango to the caregivers at the Dalumak Elderly

Care Cultural Health Station in the indigenous area (2024/12/27).

The content of this activity design is derived from the senior tango techniques and instructional activities learned by the research team in February 2025 in Buenos Aires, Argentina, under the guidance of Rodolfo Dinzel (Figure 3).

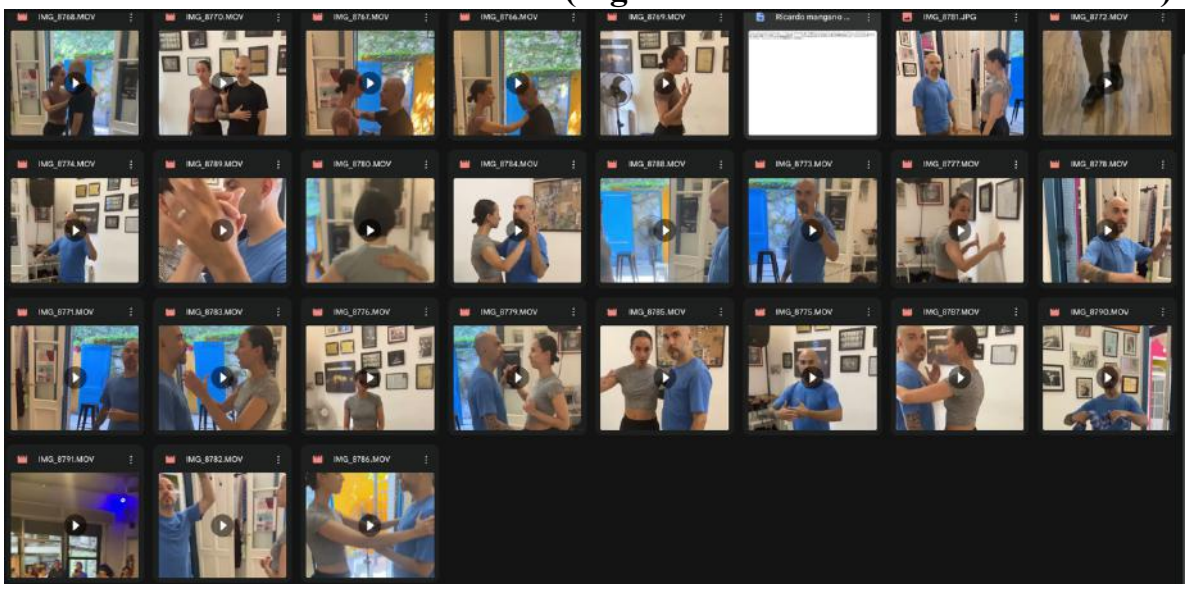

Figure 3: The senior tango techniques and instructional activities learned by the research team in February 2025 in Buenos Aires, Argentina, under the guidance of Rodolfo Dinzel (Figure 3).

Activity Design:

(1) Develop warm-up activities tailored for elderly individuals participating in tango to prevent exercise-related injuries. (2) Design a senior tango training program suitable for elderly individuals, with two-hour sessions per week for 12 weeks.Effectiveness Evaluation:

(3) Utilize pre- and post-program physical fitness assessments to determine whether senior tango enhances leg strength and balance among elderly participants. (4) Conduct semi-structured interviews and observational analyses to examine whether senior tango improves social relationships among elderly individuals.

4.1 Research Implementation and Steps

This study is planned in three main stages: preparation, execution, and results analysis.

1) Preparation Stage (February 2025):

- Gather relevant literature and confirm the research direction.
- Discuss research sites with the advising professor and visit the research site to explain the research plan and procedures.
- Obtain consent from the site administrator and elderly participants for the use of evaluation scales.

2) Execution and Testing Stage (March - May 2025):

- Conduct the 12-week tango program with one session per week, lasting two hours per session.
- Perform pre-test physical fitness assessments in the first week.
- Implement the tango instruction and practice from weeks 2 to 11.
- Conduct post-test physical fitness assessments and administer satisfaction questionnaires in week 12.

3) Data Analysis and Report Compilation (March - June 2025):

- Organize and analyze collected data.
- Integrate quantitative and qualitative results and draft the research report.

4.2 Expected Results

Engaging in warm-up exercises before dancing is expected to improve exercise safety and efficiency, allowing elderly individuals to enjoy tango dancing while reducing the risk of exercise-related injuries. The anticipated results are as follows:

1) Physiological Benefits:

- Raising body temperature and improving circulation efficiency.
- Preparing muscles and joints, increasing muscle flexibility and joint mobility.
- Enhancing cardiovascular circulation, ensuring better oxygen supply to muscles and organs, and improving endurance.

2) Psychological Benefits:

- Reducing anxiety by helping individuals adapt to the exercise environment gradually.
- Increasing concentration and body awareness through simple physical movements.

3) Performance-Related Benefits:

- Improving movement coordination and flexibility, ensuring smoother execution of dance movements.
- Extending exercise duration by preventing premature fatigue due to improper preparation.

Physical fitness pre- and post-assessments will follow the standard testing guidelines set by Taiwan's Sports Administration, particularly the fitness norms for individuals aged 65 and older. These evaluations will measure whether the tango program improves muscle strength and balance among participants.

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CV

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2021.08-2023.07	Postdoctoral Researcher, Center for Humanities Innovation and Social Practice, National Taitung University

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科技部與教育部計畫

2025-2027
- **Principal Investigator**

University Social Responsibility (USR) Project, Ministry of Education
"Mountain–Sea Net-Zero Infinity: University–Community Partnership for Circular Economy, Green Carbon, and Blue Carbon" (98,000 Euro)

2024-2025
- **Principal Investigator**

National Science Council
"The Spatial Politics of Geothermal Energy Development in Indigenous Areas: A Comparative Study of Jinlun and Hongye (Taiwan) and Waikato (New Zealand)" (21,500 Euro)

2020-2021
- **Principal Investigator**

National Science Council
"The Power of Faith: The Experience of the Swiss Catholic Bethlehem Mission Society in Taiwan" (13,700 Euro)

Elderly Tango Therapy Experience and International Collaboration

Background and Experience

- **Since 2014**, engaged in Argentine Tango practice with **11 years of experience,** including **five intensive learning trips to Argentina**, where specialized training was received from Eric Dinzel on tango leading.

- **Since September 2024**, initiated student-led research on **Elderly Tango**—adapting tango movements and dynamics to be accessible for older adults.

- **Since January 2025**, implemented **Elderly Tango** sessions at the **Drekay Taromak Indigenous Cultural Health Station** in Taitung. The program received highly positive feedback:

- ✓ Elders expressed gratitude during communal lunch prayers, thanking NTTU teachers and students for introducing tango.
- ✓ After a 10-week report by students, elders discussed in the indigenous Drekay language and **collectively decided to continue tango.**
- ✓ Care attendants requested NTTU' s ongoing involvement, emphasizing the value of tango' s **music, dance, and youthful vitality.**
- ✓ Supervisors observed positive cognitive reactions: one elder with dementia showed noticeable responses upon hearing tango music.

Professional Development

- Since 2025, member of the Taiwan Dance Therapy Association.

- Participated in "Training in Therapeutic Tango" at the University of Burgundy, France (September 22–26, 2025).

Future Directions

The team plans to integrate Drekay traditional music and dance into elderly tango therapy, enhancing cultural resonance and elder engagement.

A new cooperation agreement (MOU) with the University of Burgundy will support a joint EU Cooperation Partnerships application (March 2026). This project will collaborate with professional psychologists and neuro-research teams to scientifically evaluate the program' s impacts on positive psychology and stress reduction among indigenous elders.


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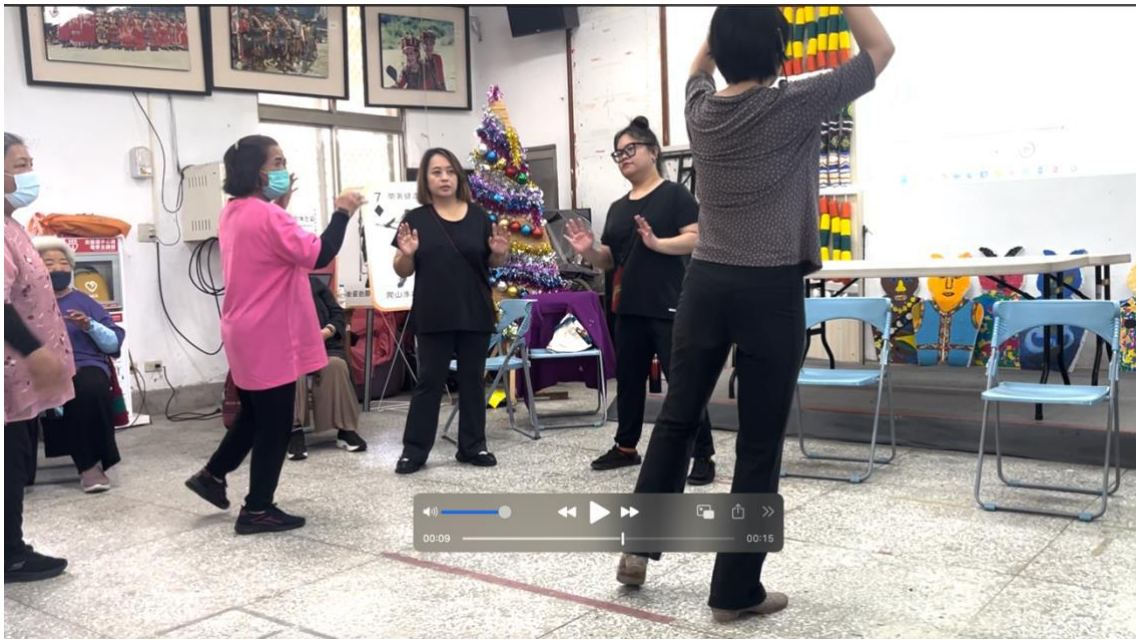
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Yung-Chen Kuo(郭詠珍)

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Education

- Tamkang University, Taiwan
  Master of Education (M.Ed.) in Educational Psychology and Counseling(Feb 2020 – Jun 2023)
- University of Manitoba, Canada
  Intensive English Program(Nov 2010 – Feb 2011)
- Cheng Shiu University of Science and Technology, Taiwan
  Bachelor of Arts in Applied Foreign Languages(Sep 2008 – Jun 2010)
- Cheng Shiu University of Science and Technology, Taiwan
  Associate Degree in Information Management (Sep 2004 – Jun 2006)

Licenses & Memberships

- Licensed Counseling Psychologist, Taiwan – License No. 006603
- Member, Taiwan Dance/Movement Therapy Association (TDTA)

Research Interests

- Child and adolescent counseling, trauma recovery, and family systems collaboration
- Integration of expressive arts and mindfulness-based approaches in counseling
- VR and AI-assisted applications in psychotherapy and counseling education
- Group counseling, crisis intervention, and systemic collaboration

Professional Experience

- Counseling Psychologist | Wu-Lun-Ru-He Counseling Center (2025–Present)
- Guidance Counselor | Zhuwei Elementary School (2023–2025)
- Lecturer | Tamkang University – Gen. Education & Counseling Centers (2023–2025)
- Intern Counseling Psychologist | Cheng Hsin General Hospital (2022–2023)

Selected Publications

- Kuo, Y.-C. (2025). AI-generated images as support for elderly oil painting creation: Exploring cognitive stimulation and emotional regulation. ISAT 2025.
- Kuo, Y.-C. (2024). Psychodrama roles and virtual reality applied in technological art: A preliminary study on immersive emotional experiences. ISAT 2024.
- Kuo, Y.-C. (2023). The study on emotion regulation strategies of college students: A case of oil painting (Master's thesis). Tamkang University.
- Shen, Y.-C., Chou, C.-H., & Kuo, Y.-C. (2023). A novel counseling assistance platform with ChatGPT and VITS. AICCC 2023.

Huang Qinfei, National Kaohsiung Normal University

Print Date: 2025-09-29 14:05

Chinese Name	Huang Qinfeng
English Name	Huang Chin Fei
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Education and Experience

School	Department	Date	Educational Level	Remarks
National Kaohsiung Normal University	Graduate Institute of Science Education	August 2005 - June2012	Ph.D.	

Employing Agency	Position	Date	Remarks
Department of Science Education, College of Science, National Kaohsiung Normal University	Professor	August 2025 - Present	
Department of Science Education and Environmental Studies, College of Science, National Kaohsiung Normal University	Associate Professor	February 2020 - Present	
Department of Science Education and Environmental Studies, College of Science, National Kaohsiung Normal University	Assistant Professor	August 2014 - January2020	

Campus Positions

Department		Title	Extension	Date
College of Science	Science Education and Environmental Education Institute	Professor		August 1, 2025 – Present
College of Science	Master's Program in Environmental and Creative Industries Part-time Degree Program	Director		August 1, 2025 ~ Present
Center for Environmental Education Research	Center for Environmental Education Research	Director		August 1, 2025 – Present
College of Science	Science Education and Environmental Education Education	Director		August 1, 2025 – Present
Academic Affairs Office	Peace Academic Affairs Division	Section Chief	1130	August 1, 2023 ~ July 31, 2025
College of Science	Science Education and Environmental Education Institute	Associate Professor		February 1, 2020 ~ July 31, 2025
Teacher Education and Career Development and Career Guidance Office	Local Education Guidance Division	Section Chief		August 1, 2020 ~ July 31, 2023
College of Science	Science Education and Environmental Education Institute	Assistant Professor	7027	August 1, 2014 ~ January 31, 2020

Journal Articles

Year	Title
2025	Burra, R., Wu, T. Y., Chang, K., & Huang, C. F.: AI-driven customer positioning and perception: Strategies, challenges and insights, Technologies Research and Applications., in press, 2025
2025	Chang, K., Kuo, C. C., Stan, O. M., & Huang, C.F.: Do challenging jobs make employees feel better or worse? Two types of psychological contract have the answer., International Journal of Organizational Analysis, in press, 2025

2024	Nguyen, L. H. P. & Huang, C. F.: The Impact of Teacher Beliefs on Teaching Practices in Environmental Issues: The Expectations of Vietnamese Elementary Teachers in the New Curriculum., Asia-Pacific Education Researcher, https://doi.org/10.1007/s40299-024-00955-x, 2024
2024	Huang, C. F. : The Influence of STEAM Teaching Activities Integrating Local Environmental Awareness on College Students' Pro-Environmental Behavior and Scientific Creativity, Journal of Baltic Science Education (SSCI)., 2024
2024	Nguyen, L. H. P. & Huang, C. F. : Evaluating Professional Knowledge for Teaching Environmental Issues in Vietnamese Elementary Schools, Journal of Baltic Science Education (SSCI), 2024
2024	Fan, M. R., Tran, N. H., Nguyen, L. H. P., & Huang, C. F.: Effects of Outdoor Education on Elementary School Students' Perception of Scientific Literacy and Learning Motivation., European Journal of Educational Research, 13(3), 1353-1363, 2024
2024	Chang, W. Y., Wang, X., Yang, S. J., Nguyen, L. H. P., Tran, N. H., Guo, D. S., Lin, H. Z., Wu, H. C., and Huang, C. F.: Explore the effects of forest travel activities on university students' stress levels., Frontiers in Psychology (SSCI), 14, 2024
2022	Chen, Y. J., Wang, S. H., Li, J. X., Chen, Z. J., Hong, Z. F., Huang, Q. F., & Ke, J. Y.: Interdisciplinary Science Communication Practice Teaching—Sunning Mushrooms Instead of People, Journal of Physics Education Education Journal, 23(2), 1-13, 2022
2022	Zhang, Y., Wang, H. T., Lin, J. L., Huang, C. F., & Hsiao, K. H.: Structural analysis of traditional Chinese blocked-keyhole padlocks, Mechanical Science (SCI), 13, 791-802, 2022
2022	Xie, L. Y., Huang, Y. Q., Huang, Q. F., & Wang, S. Q.: Design and Implementation of University Faculty Introducing STEAM into High School Micro-courses (Part II): General Education, Science Monthly Journal of Research, 61(5), 57-64, 2022
2022	Huang, Q. F., Chen, Y. K., Wu, T. H., Hsieh, K. L., & Chao, J. M. (2022). Exploring the influence of natural environments on college students' scientific creativity using EEG research methods. Green Science Journal, 12(1), 142-150, 2022
2022	Chen, L., Huang, Q., & Tang, W. (2022). Development of a Characteristic Outdoor STEAM Education Course: Botanical Cyanotype Bookmarks. Taiwan Online Science Museum Science Research Monthly (Electronic Journal), 61(4) https://www.ntsec.edu.tw/liveSupply/detail.aspx?a=6829&cat=15571&p=1&lid=19527, 2022
2022	Nguyen, L. H. P., Bui, N. B. T., Nguyen, T. N. C., & Huang, C. F.: An Investigation into the Perspectives of Elementary Pre-service Teachers on Sustainable Development, Sustainability, 14(16), 9943, 2022
2022	Huang, Q. F.: Design and Implementation of Elementary School Green Chemistry Video Experiments, Taiwan Journal of Chemistry Education, 47, 2022
2021	Tran, N. H., Huang, C. F., & Hung, J. F.: Exploring the Effectiveness of STEAM-Based Courses on Junior High School Students' Scientific Creativity, Frontiers in Education, section Educational Psychology (ERIC), 6, 1-8, 2021
2021	Xiang Wenxiong, Xie Baiqi, Huang Qinfeng: An Investigation into the Integration of Wetland Board Games for Environmental Literacy Among Junior High School Students, Journal of Environmental Education, 19, 2021
2021	Yeh, F. Y., Tran, N. H., Hung, S. H., & Huang*, C. F.: A Study of Environmental Literacy, Scientific Performance, and Environmental Problem-Solving, International Journal of Science and Mathematics Education, DOI https://doi.org/10.1007/s10763-021-10223-9, 2021
2021	Wang, J. W., Huang, C. F., & Lin, C. C.: Improving junior high school students' marine food webs learning through a SWI-Prolog-based interactive learning system, Chinese Journal of Science Education (科學教育學刊), 29(1), 57-81, 2021
2021	Huang, Q. F., Li, Z. Y., Gao, M. J., Lin, J. C., & Su, Z. J.: A neuroscience study on the relaxation and healing effects of the Man Yuanyuan National Forest Recreation Area on visitors Taiwan Forestry Bimonthly, 47(3), 67-72, 2021
2020	Shi, K., Hsiao, K.-H., Zhao, Y., Huang, C.-F., Xiong, W.-Y.: Structural Analysis of Ancient Chinese Wooden Locks., Mechanism and Machine Theory (accepted)., 146(SCI Journal), 2020
2020	Lu, Z.-L., Ke, C.-J., Gao, Y.-L., Huang, Q.-F.: Introducing a Systematic Theory to Construct the Practice and Development of Tribal Guided Tours in Wutai Township, Journal of Recreation Management Studies , 6(2), 63-71, 2020
2019	Lin, C. Y., Hsu, Y. H., Huang, C. F.: Exploring Differences in Perspectives on Sustainable Development Issues in National Parks and Adjacent Communities Among Different Stakeholder Groups, TSSCI, 27 (3), 185-205 (TSSCI Journal), 2019
2019	W.-Y. Chang, M.-T. Lo, and C.-F. Huang. (2019): The Influence of Emotional Environmental Pictures on Behavior Intentions: The Evidence of Neuroscience Technology, International Journal of Environmental Research and Public Health, 16(24), 1-8. (SSCI Journal), 2019
2019	Huang, C.-F. and Wang, K.-C. (2019). Comparative Analysis of Different Creativity Tests for the Prediction of Students' Scientific Creativity. Creativity Research Journal, 31(4), 443-447 (SSCI Journal), 2019 Journal), 2019
2019	Yang, Zhenzhen, Lin, Qiongyao, & Huang, Qinfeng. Development and Validation of an Environmental Literacy Scale for Air Pollution Among Junior High School Students. Journal of National Taichung University of Education, 33(1), 31-55. 2019
2018	Jian, M. L., & Huang, Q. F. (2018). A survey study on green consumption cognition, attitudes, and behaviors among residents in Pingtung County. Journal of Tourism and Leisure Management, 6(2), 212-226. 2018
2018	Li, Y. P., Lin, C. Y., & Huang, C. F. (2018). From Classroom to Outdoor Setting: A Comparative Study on the Application of Sewage Treatment Interpretation Programs in Elementary School Education. Journal of Recreation Management

	Research Journal, 5(2), 1-20, 2018
2018	Zhang, M. T., Lo, M. D., & Huang, Q. F. (2018). A Study on Environmental Perception, Affect, Behavioral Intentions, and Willingness to Pay Before and After Guided Interpretation Services: A Case Study of a Wastewater Treatment Plant. Journal of Recreation Management, 5(2), 21-44. Wastewater Treatment Plants as an Example, Journal of Recreation Management Research, 5(2), 21-44, 2018
2016	Lin, S.-H., Chen, S.-M., and Huang, C.-F.: Using Creative Water Reuse Earth Bag to Prevent Flood Disaster, International Proceedings of Chemical, Biological and Environmental Engineering, 96, 26-30., 2016
2015	Liu, C. J., Huang, C. F., Liu, M. C., Chien, Y. C., Lai, C. H., and Huang, Y. M.: Does gender influence emotions resulting from positive applause feedback in self-assessment testing? Evidence from neuroscience., Educational Technology and Society, 18(1), 337-350. (SSCI Journal)., 2015

Conference Paper

Year	Title
2025	Lee, P. H., & Huang, C. F.: Exploring the Impact of Elementary School Students' Participation in Net-Zero Technology Courses on Technological Literacy and Sustainability Literacy, European Conference on Research in Science Education (ESERA), 2025
2025	Huang, C. F.,* & Liu, C. N.: Exploring the Impact of 2D and VR Instructional Materials on University Students' Attention, Cognitive Load and Learning Outcomes Using Neuroscience Methodology., European Conference on Research in Science Education (ESERA), 2025
2025	Tran, N. H., Huang*, C. F., & Ngo, T. P. : Leveraging Neuroscience to Enhance Scientific Creativity and Innovation in Education through Working Memory., 7th Euraisa Conference on Biomedical Engineering Healthcare and Sustainability (2025 ECBIOS), 2025
2024	Huang, C. F. : The impact of activities that combine STEAM with local environmental consciousness on university students' pro-environmental behavior and scientific creativity., 2024 the European Conference on Education (ECE 2024), 2024
2023	Wu, Y. C., T. K. B., & Huang, C. F.: Exploring Taiwanese high school teachers' and pre-service teachers' views on integrating CLIL bilingual teaching strategies into the curriculum. 2023 International Conference on Science Education Innovation, 2023
2023	Huang, Q. F.: Preliminary Exploration of Research Outcomes Integrating University Social Responsibility with Teaching Practice. 2023 International Symposium on Sustainable General Education, Medical Humanities, and STEAM Education and Annual Conference of the Taiwan General Education Alliance and Quality Promotion Council, 2023
2022	Nguyen, L.H.P., & Huang, C. F.: Action research explores ways to utilize science toys in teaching physics at junior high school, the 5th IEEE Eurasian Conference on Educational Innovation, 2022
2022	Fan, M.-R., Tran, N.-H., & Huang, C.-F: The effects of outdoor education on perceptions of creativity of elementary school students, International conference on teaching, education and new learning technologies (ICTENLT), 2022
2022	Chen, L., & Huang, C.-F.: The effects of outdoor STEAM courses on middle school students' learning motivation and problem-solving abilities, The 32nd International Conference on Environmental Education: Theory and Practice International Symposium, 2022
2022	Huang, C.-F.: The Implications of Neuroscience Research for Education, International Conference on Teaching, Education, and New Learning Technologies (ICTENLT, ARSSS), 2022
2022	Huang, C.-F., Su, Z.-J., Lin, W.-J., Li, Y.-J., & Zeng, K.-B.: Operationalization and Feedback Practices of Environmental Education Curriculum Programs in Penghu Southern Four Islands National Park – Taking "Exploring Dongji's Flora" as an Example, The 32nd International Conference on Environmental Education: Academic and Practical Exchange, 2022
2022	Huang, Q. F., Gao, M. J., Lin, J. Q., & Li, Z. Y. (2022). Exploring Visitors' Brain Relaxation Effects After Participating in Forest Experience Activities at Man Yu Yuan National Forest Recreation Area Using EEG Research Methods. The 32nd International Conference on Environmental Education Academic and Practical Exchange, 2022. 32nd International Conference on Environmental Education: Academic and Practical Exchange, 2022
2022	Tran, N.-H., & Huang, C.-F: Application of Neuroscience in Studying the Correlation Between Working Memory Capacity, Creativity, and Scientific Creativity, 38th Annual International Conference of Science Education in Taiwan, 2022
2021	Tran, N. H. & Huang, C. F.: Orientation of educational content for science pedagogy students to fulfill the teaching requirements of sustainable development goals, 2021 International Zoom Conference East-Asian Association for Science Education, 2021
2021	Huang, Q. F., Tseng, T. D., & Chu, C. Y.: Exploring the Effects of Interdisciplinary Group Teaching in General Education Courses on College Students' Self-Efficacy, 2021 Taiwan General Education Strategy Alliance and Quality Promotion Conference, 2021
2021	Zeng, Zongde, Huang, Qinfeng*, Zhu, Qianyi: Exploring the Impact of Integrating Systems Thinking Models into General Education Courses on College Students' Self-Efficacy, 2021 Taiwan General Education Strategy Alliance and Quality Promotion Conference, 2021
2020	Yeh, F. Y., Tran, N. H., & Huang, C. F.: An investigation of environmental literacy, environmental scientific achievement and environmental problem solving among various genders, 3rd IEEE Eurasia Conference on Biomedical Engineering, Healthcare and Sustainability 2021, 2020
2020	Huang, C. F., Wang, Y. L., Kao, Y. L., & Kuo, I. C.: Exploring the influences of Taiwan high school students' problem-solving abilities on outdoor learning. Australasian Science Education Research Association (ASERA2019), 2020
2019	Zeng, Z. D., & Huang, Q. F.: Investigating the Effects of a Dual-Focus Curriculum on Theory and Inquiry-Based Practice on College Students' Problem-Solving Abilities. Taiwan General Education Strategy Alliance and Quality Promotion Council 'Teaching Practice and Cross-Domain Research Academic Symposium', 2019
2019	Huang, Qinfei; Lu, Zhiliang; Ke, Caiying; Guo, Yizheng; Zhang, Weiyin. Research on Indigenous Cultural Preservation and Forest Study Program Development in Wutai Tribe, Taiwan. "10th Cross-Strait Symposium on Biodiversity and Forest Conservation Culture," 2019
2019	Lin, C. Y., & Huang, Q. F. (2019). The Value and Practice of Traditional Ecological Knowledge in Ecotourism. International Symposium on Environmental Education: Academic and Practical Exchange in the Republic of China. 2019
2019	Chang, W.-Y., Lo, M.-T., and Huang, C.-F.: The Influences of Emotions on Environmental Pictures—Evidence from Neuroscience. The 2nd Eurasian Conference on Educational Innovation, (This paper received the Best Paper Award at the conference), 2019 Best Paper Award), 2019
2019	Wu, I.-T., and Huang, C.-F.: The investigation of public's pro-environmental behavior in Taiwan., 14th Annual Education and Development Conference (EDC 2019, March), 2019
2019	Yi-Hsuan, Hsu, Ya-Ling, Chang, Ya-Wen, Yang, W. Jasmine, Chen, and Chin-Fei, Huang.: National Policy and Strategic Approaches for School Environmental Education (EE) in Taiwan., 10th World Environmental Education Congress (WEEC 2019), 2019

2019	Huang, Qinfei, Su, Zijun, and Zeng, Zongde: Using EEG Research to Explore the Impact of Design Thinking on Problem-Solving Abilities in General Education Students. Shu-Te University General Education Symposium, 2019
2018	Huang, C.-F., Wang, K.-C., and Liu, C.-J.: Discussion on the Effectiveness of Assessing Students' Scientific Creativity Using Different Tools of Scientific Creativity., Eurasian Conference on Educational Innovation (2018 ECEI), 2018
2018	Weng, Y.-F., Lü, H.-W., Chang, J.-M., Yu, Y.-C., Chen, L.-Z., & Huang, Q.-F.: Developing Productive Aging Communities: Formation Processes and Social Justice. FACES Second Annual General Meeting and Academic Conference: Delaying the Progression of Frailty and Disability in Older Adults—From Theory to Interprofessional Care, 2018
2018	Huang, Q. F., & Su, Z. J.: Using EEG Research Methods to Investigate the Effects of Natural and Non-Natural Environmental Objects on Emotional Relaxation. , 2018
2018	Hsiang, W. H., & Huang, C. F.: The Impact of Integrating Board Games on Junior High Students' Wetland Environmental Cognition, Affect, and Behavioral Performance. 28th International Conference on Environmental Education: Academic and Practical Exchange, 2018
2017	Huang, C.-F. and Hsu, Y.-H.: Exploring the Influences of Outdoor Learning on Students' Learning Attention and Pressure Using Neuroscience Technology. 9th World Environmental Education, 2017
2017	Huang, C.-F.: A Study to Explore the Misconceptions about Science among the Elderly in Taiwan, Asian Conference on Education & International Development 2017, 2017
2017	Huang, C.-F., Wu, H.-C., Yen, S.-J., Hsu, C.-C., and Liu, C.-J.: Explore Students' Learning Strategies of Chemistry by Using Neuroscience Technology., European Conference on Educational Research (2017 ECER), 2017
2016	Huang, C.-F.: The Effects of Science Learning on EPBL Strategies., Canada International Conference on Education., 2016
2016	Lin, C.-F., & Huang, C.-F.: Constructing Environmental Education Resource Indicators for Mutual Benefit Between National Parks and Nearby Communities, 26th National Conference on Environmental Education: Academic and Practical Exchange and the 7th Cross-Strait Four Regions Sustainable Development Education Forum, 2016
2016	Huang, Qinfei, Huang, Huiwen: A Preliminary Exploration of Older Adults' Perspectives and Misconceptions Regarding Life Science and Technology, The 32nd International Conference on Science Education, 2016
2016	Wang, Jie-Wei, Lin, Che-Cheng, & Huang, Chin-Fei: Innovative Curriculum Design Integrating Information Technology and Environmental Education: A Case Study of Coral Reef Marine Areas, Conference on Educational Innovation and Talent Development, 2016 , 2016
2015	Huang, Qinfei: The Impact of Environmental Problem-Based Learning (EPBL) on Middle School Students' Environmental Knowledge, Affect, and Skills, Academic and Practical Exchange International Conference on Environmental Education in the Republic of China and East Asia Environmental Education Forum, 2015 International Symposium and East Asia Environmental Education Forum, 2015
2015	Lin, H. T., Yang, C. S., and Huang, C. F.: Integrating Environmental and Scientific Concepts into Home Economics Curriculum through Disaster Prevention Capability Development, International Conference of East-Asian Association for Science Education, 2015

Funded Project

Year	Title
2025	Study on Brainwave Changes Before and After Consumption of "Miracle Spring" Packaged Water Among the General Public (Natural Bio-Tech Food Co., Ltd.), Role: Principal Investigator Person, Funding Agency: Private Enterprise , Project Period: September 2025
2025	Future Science Education Promotion Camp Curriculum Development Project (Taiwan Future Science Education Promotion Association), Role: Project Director, Funding Agency: Private Enterprise , Project Period: 114/8
2025	Academic Year 114 Outdoor Education Curriculum (Total Project Cost: NT$130,000; Ministry of Education Grant: NT$100,000; Grant Ratio: 76.92%), Role: Project Leader , Funding Agency: Ministry of Education, National and Preschool Education Administration , Implementation Period: August 2025
2025	Academic Year 114 Outdoor Education Program (Total Project Budget: NT$130,000; Ministry of Education Grant: NT$100,000; Subsidy Rate: 76.92%). Role: Project Principal , Funding Agency: Ministry of Education, National and Preschool Education Administration , Implementation Period: August 2025
2025	Integrating Reflective Teaching Strategies and Dynamic Assessment to Explore University Students' Perception and Transformation of Learning Value in USR Practice, Role: Principal Investigator, Funding Agency: Ministry of Education Funding Agency: Ministry of Education , Project Period: 114/8
2025	Science Popularization Activity: "Generative AI Collaboration: Real-Life Three Kingdoms Showdown" Science Camp Development and Promotion, Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Executive Yuan , Project Period: 114/8
2025	Investigating the Impact of Generative AI-Assisted Learning on College Students' Scientific Creativity Using Brainwave Research Methods, Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Executive Yuan Ministry of Science and Technology, Executive Period: 114/8
2025	"Support for Domestic Experts and Scholars to Attend International Academic Conferences" (Prof. Huang Chin-Fei, Institute of Science Education and Environmental Education; Conference Dates: August 25-29, 2025) [Financial settlement to be completed within one month after the conference], Role: Principal Investigator, Funding Agency: National Science and Technology Council , Project Period: 114/8
2025	Kaohsiung STEAM School (Singapore STEAM Education Association and Gao Jian Education Co., Ltd.), Role: Project Director, Funding Agency: Private Enterprise , Project Period: July 2025
2025	Development of Green Chemistry Teaching Modules and Practical Course Promotion for University Teacher Training Students (Chemical Substances Management Agency, Ministry of the Environment), Role: Project Director, Funding Agency: : Chemical Substances Management Agency, Ministry of the Environment , Implementation Period: July 2025

2025	Manufacturer Self-Funded Project - 2025 Manufacturing Transformation Promotion Program - Carbon Footprinting Value-Added Application - Jinyongchen Technology Co., Ltd. Service Project (Ministry of Economic Affairs, Industrial Development Agency Project Code: A146204-4), Role: Project Lead, Funding Agency: Private Enterprise , Implementation Period: March 2025
2025	Company Self-Funded - 2015 Manufacturing Transformation Promotion Plan - Carbon Footprinting Value-Added Application - Jintong Industrial Co., Ltd. Service Plan (Ministry of Economic Affairs Industrial Development Agency Project Code: A146204-5), Role: Project Leader, Funding Agency: Private Enterprise , Project Period: March 2025
2025	Company Self-Funded - 2025 Manufacturing Transformation Promotion Plan - Carbon Footprinting Value-Added Application - Yijunjing Precision Industry Co., Ltd. Service Plan (Ministry of Economic Affairs Industrial Development Bureau Project Code: A146204-6), Role: Project Leader, Funding Agency: Private Enterprise , Implementation Period: 114/3
2025	2015 Annual Manufacturing Transformation Promotion Plan - Carbon Footprinting Value-Added Application - Jinyongchen Technology Co., Ltd. Service Plan (Ministry of Economic Affairs, Industrial Development Agency) (Company Self-Funded Project Code: A146308-4), Role: Project Leader, Funding Agency: Ministry of Economic Affairs, Industrial Development Agency , Implementation Period: 114/3
2025	2025 Annual Manufacturing Transformation Promotion Plan - Carbon Inventory Value-Added Application - Jintong Industrial Co., Ltd. Service Plan (Ministry of Economic Affairs, Industrial Development Administration) (Company Self-Funded Project Code: A146308-5), Role: Project Leader, Funding Agency: Ministry of Economic Affairs, Industrial Development Administration , Implementation Period : 114/3
2025	2025 , Implementation Period: 114/3
2025	Invitation to Subsidize Professor Kirk Chang from the University of East London for a Visit to Taiwan from February 13 to February 23, 2025 (Proposed by Associate Professor Huang Qinfei, Institute of Science Education and Environmental Education) [Funding Settlement to be Completed Within One Month After the Meeting], Role: Project Leader, Funding Agency: National Science and Technology Council , Implementation Period: 114/2
2025	2025 Funding Agency: Marine National Park Administration , Implementation Period: 114/2
2025	2015 "Kenting National Park Community Ecotourism and Community Industry Development Pilot Project" Commissioned Service Contract (Kenting National Park Administration), Role: Project Director, Funding Agency: Ministry of the Interior , Implementation Period: 114/1
2025	2025 Science Inquiry Competition - Teach Me This Way and I'll Understand, Role: Project Director, Funding Agency: National and Preschool Education Administration, Ministry of Education , Implementation Period: 114/1
2024	Academic Year 113 Outdoor Education Curriculum (Total Project Budget: NT$130,000; Grant Amount Applied For: NT$91,000; Self-Funded Amount: NT$39,000) (11400074), Role: Project Director, Funding Agency: Ministry of Education, National and Preschool Education Administration , Implementation Period: 113/8
2024	Academic Year 113 Outdoor Education Program (Total Project Budget: NT$130,000; Grant Amount Applied For: NT$91,000; Self-Funded Amount: NT$39,000), Role: Project Lead , Funding Agency: Ministry of Education, National and Preschool Education Administration , Implementation Period: August 2024
2024	Investigating the Effects of 2D, VR, and Physical Teaching Aids on Cognitive Load and Learning Outcomes in Science Education Using EEG Research Methods. Role: Principal Investigator. Funding Agency: Ministry of Education, National and Preschool Education Administration Funding Agency: Ministry of Science and Technology, Executive Yuan , Project Period: 113/8
2024	Investigating the Effects of 2D, VR, and Physical Teaching Aids on Cognitive Load and Learning Outcomes in Science Education Using EEG Research Methods, Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Executive Yuan Supporting Agency: Ministry of Science and Technology, Executive Yuan, Project Period: 113/8
2024	Industry-Academia Collaboration Research Project: "Future Science Education Promotion Camp Curriculum Development Plan" (Taiwan Future Science Education Promotion Association), Role: Principal Investigator , Funding Agency: Private Enterprise , Project Period: 113/8
2024	Science Outreach Activity: Developing Science Courses Integrating 3D Virtual Universe Design with Humanities and Social Issues to Enhance Middle School Students' Interdisciplinary Competencies, Role: Project Director , Funding Agency: National Science and Technology Council, Project Period: July 2024
2024	"Support for Domestic Graduate Students Attending International Academic Conferences" (Master's Program, Institute of Science Education and Environmental Education, Wu Wenxuan (Conference Dates: July 11, 2024 - July 15, 2024) [Financial Settlement to be Completed Within One Month Post-Conference]), Role: Principal Investigator, Funding Agency: National Science and Technology Council , Project Period: July 2024
2024	"Support for Domestic Experts and Scholars to Attend International Academic Conferences" (Professor Huang Qinfei, Institute of Science Education and Environmental Education (Conference Dates: July 11, 2024 - July 15, 2024) [Financial settlement to be completed within one month after the conference], Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Executive Yuan , Project Period: July 2024
2024	Developing Green Chemistry Teaching Materials and Promotional Activities to Enhance Elementary School Teachers' and Students' Knowledge and Practical Application of Green Chemistry and Toxin-Free Homes (Ministry of the Environment, Chemical Substances Management Administration) Substance Management Agency), Role: Principal Investigator, Funding Agency: Ministry of Environmental Protection Chemical Substance Management Agency , Implementation Period: July 2024
2024	2024 Manufacturing Transformation Promotion Project - Carbon Inventory Value-Added Application - Hongji Screw Industrial Service Project (Ministry of Economic Affairs, Industrial Development Administration) (Company Self-Funded Project Code: A136304-8), Role: Project Leader, Funding Agency: Ministry of Economic Affairs, Industrial Development Administration , Project Period: March 2024
2024	2024 Manufacturing Transformation Promotion Program - Carbon Inventory Value-Added Application - Guanwang Screw Industrial Service Project (Ministry of Economic Affairs, Industrial Development Bureau) (Company Self-Funded Project Code: A136304-9), Role: Project Leader, Funding Agency: Bureau of Foreign Trade, Ministry of Economic Affairs , Implementation Period: 113/3
2024	Company Self-Funded - 2024 Manufacturing Transformation Promotion Plan - Carbon Footprinting Value-Added Application - Hongji Screw Industrial Service Plan (Ministry of Economic Affairs, Industrial Development Bureau Project Code: A126207-8), Role: Project Leader, Funding Agency: Ministry of Economic Affairs, Industrial Development Bureau , Implementation Period: March 2024
2024	Company Self-Funded - 2024 Manufacturing Transformation Promotion Program - Carbon Footprinting Value-Added Application - Guanwang Screw Industrial Service Project (Ministry of Economic Affairs Industrial Development Agency Project Code: A126207-9), Position: Project Leader, Funding Agency: Bureau of Foreign Trade, Ministry of Economic Affairs , Implementation Period: 113/3
2024	2024 "Kenting National Park Community Ecotourism and Community Industry Development Pilot Project" Commissioned Service Contract (Kenting National Park Administration), Role: Project Director, Funding Agency: Ministry of the Interior, Implementation Period: 113/1

2024	2024 Science Inquiry Competition - "Teach Me This Way and I'll Understand," Role: Project Director, Funding Agency: National and Preschool Education Administration, Ministry of Education , Project Period: 113/1
2023	"STEAM Curriculum Planning" Industry-Academia Collaboration Research Project (Sichuang Digital Education Co., Ltd.), Role: Principal Investigator, Funding Agency: Private Enterprise Industry , Project Period: 112/10
2023	Science Outreach Activity: Enhancing K-12 Students' Sustainable Development and Technological Literacy through Zero-Waste Pineapple Leaf Resource Recycling and Net-Zero Transition Technology Courses (Theme II), Role: Principal Investigator, Funding Agency: National Science and Technology Council, Project Period: 112/8
2023	"National Park Marine Education Center Establishment and Trial Operation Project" (Marine National Park Administration), Role: Project Director, Funding Agency: Marine National Park Administration, Project Period: February 2023
2023	2023 Science Inquiry Competition - "Teach Me This Way and I'll Understand," Role: Project Director, Funding Agency: Ministry of Education, National and Preschool Education Administration, Project Period: 112/1
2022	"Support for Domestic Graduate Students to Attend International Academic Conferences" (Graduate Student Lin-Yu Fu, Institute of Environmental Science and Technology (Conference Date: October 8, 2022) [Submit final report within one month after the conference] Submit expense report within one month after the conference], Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Executive Yuan , Project Period: 111/10
2022	"Support for Domestic Graduate Students Attending International Academic Conferences" (Dr. Lu Zhilang, PhD Candidate, Institute of Environmental Science and Technology (Conference Date: October 8, 2022) [Submit financial report within one month after the conference Submit financial settlement report within one month after the conference], Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Executive Yuan , Project Period: October 2022
2022	"Support for Domestic Experts and Scholars Attending International Academic Conferences" (Dr. Huang Qinfei, Institute of Science and Technology for Environment (Conference Date: October 8, 2022) [Submit expense report within one month after the conference] , Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Executive Yuan , Project Period: 111/10
2022	Academic Year 2022 Outdoor Education Curriculum Project, Role: Project Leader, Funding Agency: Ministry of Education , Implementation Period : August 2022
2022	Integration of CLIL Bilingual Teaching Strategies into High School Inquiry-Based Practical Courses, Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Executive Term: August 2022
2022	Academic Year 111 Outdoor Education Curriculum Plan, Role: Principal Investigator, Funding Agency: Ministry of Education, Implementation Period: 111/8
2022	New Southbound Initiative 2022 (Enhancing Cooperation and Exchange with ASEAN and South Asian Countries), Role: Principal Investigator, Funding Agency: Ministry of Education, Implementation Period: August 2022
2022	Science Popularization Activities: Enhancing Core Competencies of Primary and Secondary Students through Science Camps Integrating STEAM and TED Communication Training (Theme 1), Role: Project Director, Funding Agency: Ministry of Science and Technology, Executive Yuan, Project Period: 2022/8
2022	Academic Year 111 Outdoor Education Curriculum Plan - Matching Funds [Implemented per Approved Case No. 1111007344] (11100137)(11200071), Role: Project Director , Funding Agency: Ministry of Education , Implementation Period: August 2022
2022	"STEAM Curriculum Planning" Industry-Academia Collaboration Research Project (Sichuang Digital Culture & Education Co., Ltd.), Role: Project Director, Funding Agency: Private Enterprise , , Project Period: June 2022
2022	Organized the "Senior High School Students' Circular Economy and Green Living Practice - Sustainable Action Leadership Camp" summer program. Role: Project Director. Funding Agency: Ministry of Education. Funding Agency: Ministry of Education , Implementation Period: June 2022
2022	Applying Green Chemistry Teaching Materials and Innovative Lesson Plans to Enhance University Students' Green Chemistry Literacy, Role: Project Director, Funding Agency: Environmental Protection Administration, Executive Yuan Bureau of Toxic Substances and Chemicals , Implementation Period: June 2022
2022	2022 Higher Education Deepening Plan (USR-HUB Mud Volcano Passion), Role: Principal Investigator, Funding Agency: Ministry of Education, Implementation Period: Jan 2022
2021	2021 Kenting National Park "Mountain and Sea Natural Healing" Series Activity Plan (Kenting National Park Administration), Role: Project Director, Funding Agency: Kenting National Park Administration , Project Period: 110/11
2021	"Youth Science Leadership Competition and Expert Symposium" Industry-Academia Collaboration Research Project (Kaohsiung City Love Science Education Association), Role: Project Director, Funding : Private Enterprise, Implementation Period: 110/9
2021	"Future Science Education Promotion Camp Curriculum Development Project" Industry-Academia Collaboration Research Project (Taiwan Future Technology Education Promotion Association), Role: Principal Investigator Funding Agency: Private Enterprise, Project Period: September 2021
2021	"Environmental and Science Education Camp Curriculum Promotion Project" Industry-Academia Collaboration Research Project (Huanxiang Travel Agency Co., Ltd.), Role: Project Director, Funding Agency: Private Enterprise, Implementation Period: September 2021 : Private Enterprise , Project Period: September 2021
2021	"Ancient Technology Science Camp Curriculum Development Project" Industry-Academia Collaboration Research Project (Creative Timeless Technology Co., Ltd.), Role: Project Director, Funding Funding Agency: Private Enterprise , Implementation Period: September 2021
2021	(Recurring Budget - Two-Year Term) Cultivating Education in Challenging Environments, Nurturing Education from Challenging Environments [General - 2021 College Teaching Practice Research Project], Role: Project Principal Investigator, Funding Agency: Ministry of Education , Implementation Period: 110/8
2021	Investigating the Impact of STEAM Courses on Junior High Students' Creativity and Scientific Creativity, Role: Principal Investigator, Funding Agency: Ministry of Science and Technology, Project Period: August 2021
2021	Science Outreach Activities: Enhancing Public Problem-Solving Skills and Scientific Creativity through STEAM Outreach Activities (Theme 4), Role: Principal Investigator, Funding Agency: Ministry of Science and Technology Science Popularization Program, Project Period: 110/8
2021	"Implementing Green Chemistry Education Activities - Utilizing Green Chemistry Teaching Materials and Innovative Lesson Plans to Enhance Green Chemistry Literacy Among Primary/Secondary Students and the General Public" - Bureau of Toxic Substances and Chemicals, Environmental Protection Administration, Executive Yuan (Subsidized Items: Materials, Temporary Labor, Printing Costs (including photocopying, typing, laminating, binding, and binding), Lecture Hourly Fees, Supplementary Premiums, Domestic Travel, and Classroom Rental Fees) Position: Project Principal Investigator Funding Agency: Bureau of Toxic Substances and Chemicals, Environmental Protection Administration), lecture fees, supplementary insurance premiums, domestic travel expenses, and classroom rental fees), Role: Project Director, Funding Agency: Bureau of Toxic Substances and Chemicals, Environmental Protection Administration , Project Period: May 2021
2021	2021 Pilot Program for New Industrial Pioneers - "Brain Science Biotechnology Industry Cutting-Edge Talent Training Program" (Ministry of Labor, Workforce Development Agency, Kaohsiung-Pingtung-Penghu-Taitung Branch), Role: Project Director, Funding Agency: Ministry of Labor, Workforce Development Agency, Kaohsiung-Pingtung-Penghu-Taitung Branch, Implementation Period:

	Position: Project Director, Funding Agency: Ministry of Labor, Implementation Period: 110/4
2021	"2021 Penghu Southern Four Islands National Park Environmental Education Professional Management Implementation Plan" (National Marine Parks Administration), Role: Project Director, Funding Agency: Marine National Park Administration, Project Period: 2021/3
2021	2021 Higher Education Deepening Plan (USR-HUB Mud Volcano Passion), Role: Project Director, Funding Agency: National Kaohsiung Normal University, Implementation Period: January 2021
2020	(Recurring Budget) Research on Enhancing University Faculty and Student Scientific Creativity and Holistic Literacy through STEAM Integrated Innovation Teaching Strategies [General- 2020
2020	"Implementing Applied Green Chemistry Education Activities - Utilizing Green Chemistry Teaching Materials and Innovative Lesson Plans to Enhance University Students' Green Chemistry Literacy" - Bureau of Toxic Substances and Chemicals, Environmental Protection Administration, Executive Yuan (Funding Items: Materials, Temporary Labor, Printing (including photocopying, typing, laminating, and binding), Lecture Hourly Fees, Supplementary Insurance Premiums, Domestic Travel, and Classroom Rental Fees), Position: Project Principal Investigator, Funding Agency: Bureau of Toxic Substances and Chemicals, Environmental Protection Administration, Executive Yuan, Project Period: June 2020
2020	C096111 Project Matching Funds - Education x Innovation x Sustainable Development - Inter-University Academic Exchange Conference & Sustainable Development Market (Grant Amount: NT$50,000, Self-Funded Amount: NT$50,000) (10900181), Role: Project Leader, Funding Agency: Kaohsiung City Government Research Development and Evaluation Committee , Implementation Period: 109/6
2020	Innovative Veterinary Entomology Camp Curriculum (Muyu Creative Co., Ltd.), Role: Project Director, Funding Agency: Muyu Co., Ltd., Implementation Period: June 2020
2020	Education x Innovation x Sustainable Development - Inter-University Academic Exchange Conference & Sustainable Development Market, Role: Project Director, Funding Agency: Kaohsiung City Government Research and Development Evaluation Committee , Implementation Period: June 2020
2020	2020 Higher Education Deepening Plan (USR-HUB Collaboration: Igniting Passion for Mud Volcanoes in Tianliao Community), Role: Project Director, Funding Agency: National Kaohsiung , Implementation Period: January 2020
2019	Ancient Technology and Mechanical Course Development and Instructor Training - Creative Times Technology Co., Ltd., Role: Project Leader, Funding Agency: Other Agency , Project Period: 2019/9
2019	(Recurring Budget) Applying Bloom's Taxonomy to Develop Innovative Teaching Models for Enhancing Interdisciplinary Professional Growth of Science Teacher Trainees, Role: Project Principal , Funding Agency: Ministry of Education, Project Period: 108/8
2019	"Implementing College Education Activities Applying Green Chemistry" - Bureau of Toxic Substances and Chemicals, Environmental Protection Administration, Executive Yuan (Funded Items: Materials, Printing Costs, Lecture Hourly Fees, Meal and Beverage Expenses) This project does not cover National Health Insurance (NHI) premiums. Role: Project Principal Investigator, Funding Agency: Bureau of Toxic Substances and Chemicals, EPA, Implementation Period: 108/7
2019	Chiayi City 2019 Science 168 Education Expo Science Challenge Experience (Xuanxin Elementary School, Chiayi City), Role: Project Leader, Funding Agency: Other Agency , Implementation Period: 108/7
2019	Industry-Academia Collaboration Project for "Science Literacy and Experiment Competition" (Kaohsiung City Love Science Education Association), Role: Project Director, Funding Agency: Private Enterprise , Project Period: June 2019
2019	Ministry of Education Environmental Education Youth International Leadership Program (2019), Role: Program Director, Funding Agency: Ministry of Education, Implementation Period: March 2019
2019	Council of Agriculture, Executive Yuan, Soil and Water Conservation Bureau, Rural Regeneration Fund Project - 2019 - 108-Nong-Zai-1.1.1-2.1-Bao-02801--Cross-Boundary Integration of Teacher Trainees and Farmers Villages, Transforming Wutai Lily Flower Curriculum, Role: Project Director, Funding Agency: Council of Agriculture Soil and Water Conservation Bureau, Implementation Period: February 2019
2018	Environmental Education Teacher Training Program (Environmental Education), Role: Project Leader, Funding Agency: Ministry of Education, Implementation Period: 107/8
2018	Science Outreach Activity: Developing Integrated STEM Maker Education Curriculum to Enhance Public Problem-Solving Skills (Theme 1), Role: Project Leader, Funding Agency: Ministry of Science and Technology, Implementation Period: August 2018 : Ministry of Science and Technology, Project Period: 107/8
2018	Using Pro-Environmental Behavior Theory to Examine the Impact of Outdoor Education on Problem-Solving Abilities Among Taiwanese Elementary and Secondary Students, Role: Principal Investigator, Funding Agency: Ministry of Science and Technology Project, Implementation Period: August 2018
2018	(Recurring Budget) Enhancing Problem-Solving Abilities of University Teacher Education Students Through Dual Approaches of Theoretical Instruction and Inquiry-Based Practice, Role: Principal Investigator, Funding Agency: Ministry of Education, Project Period: 107/8
2018	2018 Ministry of Education Environmental Education Youth International Leadership Program, Role: Principal Investigator, Funding Agency: Ministry of Education, Implementation Period: April 2018
2018	2018 Rural Practice Co-creation Program for Universities - Innovative Service Curriculum for Senior Education Industry [Soil and Water Conservation Bureau], Role: Principal Investigator, Funding Agency: Water Conservation Bureau, Executive Term: 107/2
2017	Environmental Education Teacher Training Program (Environmental Education), Role: Project Director, Funding Agency: Ministry of Education , Project Period: August 2017
2017	Creative Course Development for Rural Elderly Care Centers - Innovative Service Courses for Rural Senior Education Industry [Soil and Water Conservation Bureau], Role: Project Director, Funding Agency: Bureau of Soil and Water Conservation, Council of Agriculture, Executive Term: March 2017
2016	Environmental Education Teacher Training Program (Environmental Education), Role: Project Leader, Funding Agency: Ministry of Education , Project Period: August 2016
2015	Research on Enhancing Secondary Students' Environmental Awareness, Affect, and Skills through Localized Environmental Science Curriculum, Role: Principal Investigator, Funding Agency: Executive Yuan, National Science and Technology Council , , Project Period: November 2015
2015	Environmental Education - Environmental Education Teacher Training Program - Final Report 1050319, Role: Principal Investigator, Funding Agency: Ministry of Education , Project Period: 104/8

Monograph

Year	Title
2021	Multi-authored collection, edited by the author, Cross-disciplinary Innovation Teaching Case Design Toolbook, Guan Jinda Cultural Enterprise Co., Ltd., in press

2019	Huang, Qinfei. "Scientific Creativity: When 'Seeking Truth from Facts' Meets 'Unbridled Imagination'." In Zheng, Yingyao (ed.), "Theory and Practice of Human Creativity (Chapter 13)" (pp. 407-420). Yuan-liu Publishing Co., Ltd. Creativity Theory and Practice (Chapter 13)" (pp.407-420)
2018	Huang, Qinfei. Innovative Environmental Education Lesson Plans for Elementary and Junior High Schools. Three Boards. Guan Jinda Culture Enterprise Co., Ltd. 1
2018	Huang, Qinfei. Innovative Environmental Education Lesson Plans for Elementary and Junior High Schools, 2nd Edition. Published by Guanjinda Culture Enterprise Co., Ltd. 1
2017	Huang Qinfei, Innovative Environmental Education Lesson Plans for Elementary and Junior High Schools, First Edition, Published by Guan Jinda Cultural Enterprise Co., Ltd., 1
2016	Liu, J. R., & Huang, Q. F. (2016). Neuroscience in Innovative Science Education: Strategies Integrating Brainwave Research with Science Education. Gao Jiao Publishing House, in "Taiwan Science Education Research and Practice: Challenges and Opportunities" (ed. by Qiu Mei- Hong, Eds.), Research and Practice in Taiwan Science Education: Challenges and Opportunities (Chapter 12) (pp. 307-326).
2015	Liu, C. J., and Huang, C. F., Affective Dimensions in Chemistry Education, SPRINGE, In: Chiu, M. H. (ed). Science Education Research
2015	Liu, C. J., and Huang, C. F., Innovative Science Educational Neuroscience: Strategies for Engaging Brain Waves in Science Education Research, SPRINGER., in Chiu, M. H. (ed).
2015	Liu, C. J., Chiang, W. W., Huang, C. F., and Shen, M. H., The Implications of Science Teaching and Practices on Educational Neuroscience., SPRINGER., In: Khine, M. S. (ed).

Patent

Year	Patent Number	Patent Title	Date Granted	Granted Country
2015	M512221	Eco-Friendly Battery	201511	Republic of China

Research and Development of Teaching Materials, Teaching Aids, or Media

Academic Year	Subject	Development Content
111	Signing of Strategic Alliance Partnership Plan	Wu Lian-shang Leads National Kaohsiung Normal University Team to Wutai Township for Agreement Signing (https://money.udn.com/money/story/5723/6277531)
111	Signing of the Memorandum of Understanding for the "Cooperation Agreement"	National Kaohsiung Normal University Joins Hands with Marine Conservation Office to Promote Marine Environmental Education and Create Multiple Wins (https://www.bo6s.com.tw/news_detail.php?NewsID=56950)
111	University Social Responsibility (USR)	National Kaohsiung Normal University Partners with Lin Hsien-tang Museum to Build Cross-Domain Science Education Chain (https://www.ftvnews.com.tw/news/detail/2022704W0226)
111	Local Revitalization Strategy Alliance Partnership	National Kaohsiung Normal University Signs Cooperation Agreement with Namasia to Promote Regional Strategy Alliance (https://money.udn.com/money/story/5723/6163882)
111	Wutai Township Office Collaborates with Kaohsiung Normal University's College of Science Dean Hong Zhenfang and Institute of Science Education and Environmental Studies Environmental Education Institute	Breathe in the Forest in Pingtung! Experience the negative ion shower alongside the "Sacred Mountain Waterfall"! (https://orange.udn.com/orange/story/121315/6096789)
111	Industry-Government-Academia Exchange	Promoting 5G Applications: Kaohsiung Economic Development Bureau Collaborates with Digital Twin Society for Industry-Government-Academia Exchange | Kaohsiung (https://n.yam.com/Article/20221209800021)
110	University Social Responsibility (USR)	Creating an Elegant New Experience in Tianliao: National Kaohsiung Normal University Develops "Drunk-Proof" Gift Box (https://reurl.cc/QW0jK0)
109	Innovative Teaching Tools	2020 National Science Museum Features Article on Innovative Music Ferris Wheel Teaching Tool
109	Innovative Teaching Aids	2021 National Science Museum Article on STEAM Innovative War Crossbow Teaching Tool
2019	National Kaohsiung Normal University Team Collaborates with National Taipei Science Education Museum to Develop New Science Curriculum: Original Paper Box Barbecue	2019 National Kaohsiung Normal University team interviewed by United Daily News on science teaching methods (https://udn.com/news/story/6885/4045489)
2019	With Only 5 Students, Huijing Elementary Welcomes Science Outreach Event	2019 Interviewed by Liberty Times on Science Outreach Programs in Rural Areas (https://news.ltn.com.tw/news/life/breakingnews/2949418)
108	University Rural Practice Collaborative Achievement Sharing Session Rural Practice, Innovative Education, Co-Creating Rural Communities New Value	2018 Interview with Business Weekly Concept and Content of Rural Practice Program (https://www.businessweekly.com.tw/focus/blog/21636)
108	Cross-Strait Forum · 10th Cross-Strait Symposium on Biodiversity and Forest Conservation Culture	2019 Cross-Strait Forum Coverage Research Team Publication: Assistant Professor Huang Qinfei of National Kaohsiung Normal University, using the Wutai Tribe in Pingtung, Taiwan as an example (http://www.taiwandiginews.com.tw/?p=120005) (http://www.yidasheng.net/a/xinwenzhongxin/gongsixinwen/614.html)
108	National Kaohsiung Normal University and Southern Taiwan University of Science and Technology Collaborate to Implement STEAM Curriculum Department's STEAM Curriculum	2019 Featured in Special Express Pioneer News coverage of our team's science popularization initiative promotion (https://www.anxiou-vanguard-8.com/index.php/print/5d26ef4396482)
108	Fujian Agriculture and Forestry University College of Forestry Hosts Academic Forum on Forest Wellness and Environmental Education	2019 Invited by Fujian Agriculture and Forestry University Professor Huang Qinfeng, Director of the Taiwan Educational Research Association, delivered keynote speeches titled: "Current Status and Trends in Forest Therapy Development in Mainland China," "Research Prospects for Forest Wellness from the Perspective of Environmental Psychology's Essence and Nature," and "Interpreting the Appeal of Forest Wellness and Nature Education Through Brainwave Analysis" (http://www.fafu.edu.cn/2019/0118/c127a43212/page.htm)
108	National Kaohsiung Normal University Promotes Science Literacy Education Through Hands-On Experiential Courses	2019 Exclusive Interview with Port City News Channel Our Team's Science Camp for Science Popularization Project (https://www.youtube.com/watch?v=xSfV2RFdvUE)
108	Youth Moving the World: We Are Children of the Ocean—Participating in the U.S. Environmental Education Youth International Leadership Camp	2019 Exclusive Interview with National Education Radio Taiwan-U.S. International Environmental Youth Leadership Camp Project (https://www.ner.gov.tw/program/5a83f4eac5fd8a01e2df0194/5cf7ef5a98b402000 7517b30?fbclid=IwAR3aTFY0qGDPjiv_xdHApFHcRbv-IBv9WmzmNRoHkWYM_bOPtZqZ72AhWZ8)
108	Included in the Taipei Science Education Museum's 2019 Collection Article	STEAM Creative Teaching Aids Development -- Owl Combination Lock
2018	October 2, 2018 Eastern Region Mathematics and Science Session Sharing Assistant Professor Huang Qinfei Professor	Ministry of Education Teaching Practice Research Project Mathematics and Science Discipline Sharing (https://www.youtube.com/watch?v=esNDf7WN7EE)
107	Sustainable Chemistry Symposium - Professor Huang Qinfeng, National Kaohsiung Normal University	Interviewed by Sustainable Chemistry (https://www.youtube.com/watch?v=LaSeMuR8-Mc) (https://www.youtube.com/watch?v=siCaHWx1FfQ)

106	Rooting Environmental Education: National Kaohsiung Normal University Takes Victory Elementary Students on Forest Excursions	2017 Interview Experience Indigenous Culture and Environmental Education (Photo by Reporter Tseng Yen-chun) (https://www.epochtimes.com.tw/n236144/%E6%89%8E Foundation of the Great Teacher's Teaching - %98%E5%B8%AB%E5%A4%A7%E5%B8%B6%E5%8B%9D Learn and Play %E8%B5%B0%E5%B1%B1%E6%9E%97.html)
105	2016 Farmland Camp	Featured on Public Television (https://www.youtube.com/watch?v=tljjB5V3VSo&feature=youtu.be)

Supervising Student Theses

Academic Year	Student Name	Degree Pursued	Graduation Date	Thesis Title or Awarded Achievement (English Thesis Title or Awarded Achievement)
112	Liu Yuping	Master	202406	Exploring the Impact of Activity Designs Incorporating Hakka Folk Plants on Elementary Students' Sense of Place
112	Huang Shiyong	Master	202307	Market Sales Survey Research on Healthy Dietary Meals
111	Sun Yu-ting	Master's	202407	An Exploration of Environmental Literacy in Wetland Conservation Among Individuals from Diverse Backgrounds
111	Chen Qihong	Master's	202407	Research on Carbon Accounting Mechanisms for Industrial Control System Panel Upgrades: A Case Study of Equipment Panel Upgrades at a Factory in Kaohsiung as an Example
111	Shu-Hui Tsai	Master's Degree	202407	An Investigation into Differences in Employee and User Perceptions of Corporate ESG Policy Implementation: The Case of Chunghwa Telecom as an Example
111	Wu Yizhen	Master's Degree	202406	A Study on High School Teachers' Perspectives Regarding the Integration of CLIL Bilingual Teaching Strategies into High School Curriculum
111	Zeng Kaibin	Master's	202406	A Survey Study on University Students' Participation in USR Programs Across Different Disciplines: The Case of Tianliao Field
111	Huang Jing	Master	202406	Exploring the Influence of Different Social Expectancy Responses on College Students' Environmental Behavioral Intentions Using EEG Research Methods
111	Chen Lei	Master	202307	Exploring the Effects of Outdoor STAEM Courses on Middle School Students' Learning Motivation and Problem-Solving Abilities
111	Li Wanwei	Master's	202307	Environmental Behavior and Purchase Intentions/Willingness to Pay for Products Incorporating Circular Economy Elements Among Secondary Students from Diverse Backgrounds Willingness to Pay
111	Chuang-Yuan Chiu	Master's Degree	202207	A Comparative Study of Perspectives on Physical Retail Channels, Virtual Channels, Experiential Marketing, and Brand Loyalty Among Consumers from Different Backgrounds Regarding Cosmetics
110	Fang Siheng	Master's	202207	An Investigation into the Effects of Different Environmental Contexts on Emotional Relaxation Among Individuals
110	Deng Rongxiang	Master's	202207	A Study on Enhancing Consumers' Willingness to Purchase Eco-Friendly Products Using Environmental Protection Videos
110	Dai Shimin	Master's	202207	An Investigation into Differences in Perspectives on Environmental Sustainability and Economic Development in Alishan National Scenic Area Among Different Stakeholder Groups Differences
110	Chu Kuan-Ying	Master's Degree	202207	A Study on College Students' Perceptions, Attitudes, and Behaviors Toward Sustainability Education
110	Hong Enhui	Master's	202207	Using Environmental Psychology to Improve Café Management: A Case Study of Starbucks Outlets
110	Lin Yuguo	Master's Degree	July 2022	An Investigation into the Impact of Different Environmental Photographs on Environmental Awareness Among the General Public
110	Yuen Lam Yau Fuk	Ph.D.	202406	Exploring the Role of Teachers' Expertise in Environmental Issues within Science Curriculum: Bridging Beliefs and Practice
110	Chen Yuhui	Ph.D.	202306	A Study on College Students' Scientific Creativity Using Applied Neuroscience
109	Huang Jingwen	Master	202406	Reflections and Exploration on Enhancing Environmental Literacy Among Special Education Students in Vocational High Schools Through Integrating Environmental Education Topics into Curriculum
109	Su Yunqiao	Master	202207	Examining the Impact of Economic, Social, and Environmental Factors on Public Fertility Intentions
109	Huang Kaiqi	Master's	202207	The Impact of Environmental Literacy on Consumers' Willingness to Purchase Green Products
109	Chen, Shih-Ying	Master's	202207	Differences in Attention to Origin, Price, and Sales Points of Organic Foods Among Consumers with Varying Health Awareness Levels Analytical Study
109	Xie Minshan	Master's Degree	July 2022	The Impact of Picture Book Instruction and Lasy Building Block Instruction on Young Children's Creative Expression
109	Yang Peizhen	Master's	202206	An Investigative Study on Perceptions of Digital vs. In-Person Courses

109	Chen Yanfei	Master's	202206	Study on the Impact of Marine Environmental Education Courses on Marine Literacy Among Junior High School Students
108	Zheng Yanling	Master's	202106	An Investigation of High School Students' Scientific Argumentation Performance on Sustainable Development Issues
108	Fan Ming-jen	Master's	202106	The Impact of Outdoor Education on Science Literacy Awareness and Learning Motivation Among Upper-Grade Elementary Students
108	Wang Yilin	Master's	202101	The Effects of Service Failures, Perceived Risk, and Customer Switching Costs on Tourist Repurchase Intentions —A Case Study of Introducing Community-Based Ecotourism in Kenting
108	Zhang Juanjuan	Master's	202001	A Comparative Study on Elementary School Children's Perception of Differentiated Environments Using Brainwave Analysis
107	Cai Ruimin	Master's	202306	A Study on the Effects of Spiral Variation Teaching Strategies on Fifth-Grade Elementary Students' Learning Outcomes in Algebra Units An Action Research Study
107	Huang, Yan-Jie	Master's Degree	202301	A Study on the Motivations and Career Development of Individuals Pursuing Environmental Education Certification
107	Su, Ziyun	Master	202106	A Study on the Effects of Natural Objects and Natural Environments on Emotional Relaxation Using EEG Research Methods
107	Zhang Juanjuan	Master's	202001	A Comparative Study on Elementary School Children's Perception of Differentiated Environments Using Brainwave Analysis
107	Lin Yinru	Master's	201807	A Study on the Impact of Local Environmental Education Programs on Environmental Literacy Among Junior High School Students: Taking Water Pollution Issues as an Example (Co-advisor: Professor Liu Jia-ru)
107	Wang Jie-wei	Master	July 2018	The Impact of Integrating Artificial Intelligence Technology into Food Web Concept Instruction on Environmental Literacy Among Junior High School Students (Co-advisor: Professor: Lin, Tse-Cheng)
107	Hsiang Wen-Hsiung	Master	July 2018	Exploring the Effects of Learning Strategies Incorporating Board Games on Junior High Students' Wetland Environmental Knowledge, Affective Attitudes, and Behavioral Performance Impact
107	Luo Mingde	Ph.D.	June 2023	An Investigation of the Effects of Positive and Negative Emotional Environmental Materials on College Students' Brain Waves and Decision-Making Performance from a Social Neuroscience Perspective 107
107	Kao Yu-Lun	Ph.D.	202301	Developing Elements of Media Literacy for Police Personnel Using Mixed Methods and Constructivist Grounded Theory
107	Lin Ching-yao	Ph.D.	202006	The Value and Practice of Traditional Ecological Knowledge in Ecotourism at Kenting National Park
106	Yang Zhenzhen	Master	201707	Study on the Impact of Integrating Air Pollution Themes into Multimedia Teaching Activities on Environmental Literacy Among Junior High School Students
106	Xu Cuiling	Master's	201707	An Investigation of the Effects of Transformational Leadership on Team Knowledge Sharing and Work Performance: The Case of Volunteers at Kenting National Park Volunteers
106	Zhang Min-Ting	Master's Degree	201707	A Study on Public Satisfaction with Guided Tour Services and Willingness to Pay: The Case of Wastewater Treatment Plants
106	Li Yuping	Master	201707	From Field to Classroom: A Comparative Study of Sewage Treatment Interpretation Programs in Elementary School Classrooms and Field Trips Comparative Study
106	Chien, Mo-Li	Master's Degree	July 2017	A Survey Study on Public Perceptions, Attitudes, and Green Consumption Behaviors: The Case of Pingtung County
106	Cai Fangyi	Master	201707	Exploring Elementary Students' Perception of Marine Concepts Through Children's Drawings
105	Xiang Wenxiong	Master	201906	Exploring the Effects of Integrating Board Game Activities into Learning Strategies on Junior High Students' Wetland Environmental Cognition, Affective Responses, and Behavioral Performance of Learning Strategies Incorporating Board Games
105	Wang Jiewei	Master's	201906	The Impact of Integrating Artificial Intelligence Technology into Food Web Concept Instruction on Environmental Literacy Among Junior High School Students
105	Jian Mo-Li	Master's	201806	A Survey Study on Public Green Consumption Awareness, Attitudes, and Behaviors: A Case Study in Pingtung County
105	Yang Zhenzhen	Master	201806	The Impact of Integrating Air Pollution Themes into Multimedia Teaching Activities on Environmental Literacy Among Junior High School Students
105	Li Yuping	Master	201806	From Field to Classroom: The Application of Sewage Treatment Explanation Programs in Classroom Instruction and Their Impact on Environmental Literacy Among Elementary School Students 105
105	Hsu Tsui-ling	Master's Degree	201806	An Investigation of Transformational Leadership's Impact on Team Knowledge Sharing and Work Performance -A Case Study of Interpretive Volunteers at Kenting National Park-
105	Zhang Min-Ting	Master's Degree	June 2018	A Study on Public Satisfaction with Guided Interpretation Services and Willingness to Pay: The Case of Wastewater Treatment Plants
105	Lin Ching-Yao	Master	201607	Analysis of the Importance of Educational Factors for Sustainable Development in Kenting National Park and Adjacent Communities
105	Wang Guanzhi	Master's	201607	An Investigation into the Effectiveness of Assessing Students' Scientific Creativity Using Different Scientific Creativity Assessment Tools (Co-Advisor: Professor Liu Jiaru)
105	Chang Meng-Ting	Master's Degree	July 2016	A Study on the Impact of Interdisciplinary Environmental Courses on Environmental Literacy Among Junior High School Students: Taking Air Pollution Courses as an Example

				(Co-advisor: Professor Liu Jia-ru)
105	Ye Fan-Yu	Master	July 2016	A Study on High School Students' Scientific Performance and Environmental Problem-Solving Strategies
104	Lin Yinru	Master's Degree	June 2019	A Study on the Impact of Local Environmental Education Courses on Environmental Literacy Among Junior High School Students: Taking Water Pollution Issues as an Example As an Example
104	Fang-Yi Tsai	Master's Degree	201806	Exploring Elementary Students' Perception of Ocean Concepts Through Children's Drawings
104	Ye Fanyu	Master's	201706	A Study on High School Students' Scientific Performance and Environmental Problem-Solving Strategies
104	Guo Yujun	Master	201506	A Study on Critical Thinking Regarding Nuclear Energy and Environmental Issues Among Sixth to Eighth Graders Using Online Courses (Co-supervised by: Professor Liu Jiaru / Online Course Supervision: Professor Zhang Xinyi)
103	Wang Guan-Zhi	Master	201706	An Investigation into the Effectiveness of Assessing Students' Scientific Creativity Using Different Scientific Creativity Assessment Tools
103	Zhang Mengting	Master	201706	A Study on the Impact of Interdisciplinary Environmental Courses on Environmental Literacy Among Junior High School Students: The Case of Air Pollution Courses as an Example
102	Guo Yujun	Master's	201606	A Study on Critical Thinking Regarding Nuclear Energy and Environmental Issues Among Sixth to Eighth Grade Students Through Online Courses

Course Taught

Academic Year	Course Code	Course Title	Academic System
1141	KL105	Criticism of Science Educational Periodicals	[Day]
1141	YF101	Studies in World Economic Environment	[Continuing Education - Evening Program]
1141	YF201	Studies in Cross-Cultural Communication Management	[Continuing Education - Evening Program]
1141	YO202	Studies in Creative Strategy and Practice	[Continuing Education - Evening Program]
1141	KL301	Special Topics in Science Education (1)	[Day]
1141	KL305	Criticism of Science Educational Periodicals	[Date]
1141	KL402	Special Topics in Science Education (3)	[Date]
1141	SC401	Outdoor Education	[Sun]
1141	AL401	Outdoor Education	[Sun]
1141	AJ401	Outdoor Education	[Sun]
1131	KL106	Special Topics on Professional Development for Science Teachers	[Date]
1131	KL406	Special Topics on Professional Development for Science Teachers	[Date]
1131	SC401	Outdoor Education	[Date]
1131	AL401	Outdoor Education	[Sun]
1131	AJ401	Outdoor Education	[Sun]
1131	GR912	National Parks and Sustainable Development	[Date]
1132	KL107	Instruction for Environmental Education	[Date]
1132	KL302	Studies in the History and Philosophy of Science	[Date]
1132	KL306	Instruction for Environmental Education	[Japanese]
1132	AL401	Inquiry and Practice	[Sun]

1132	AJ401	Inquiry and Practice	[Sun]
1132	GR848	Exploring and Learning in Museums	[Sun]
1121	KL105	Environmental Education	[Sun]
1121	KL307	Environmental Education	[Date]
1121	SC401	Outdoor Education	[Date]
1121	AL401	Outdoor Education	[Sun]
1121	AJ401	Outdoor Education	[Sun]
1122	KL107	Instruction for Environmental Education	[Date]
1122	KL306	Instruction for Environmental Education	[Japanese]
1122	KL307	Criticism of Science Educational Periodicals	[Date]
1122	AL401	Outdoor Education	[Date]
1122	AJ401	Outdoor Education	[Sun]
1122	AJ402	Inquiry and Practice	[Date]
1122	AL402	Inquiry and Practice	[Sun]
1122	GR905	Introduction to Marine Humanities and Social Sciences	[Date]
1111	KL106	Environmental Education	[Date]
1111	KL107	Academic Writing in Science Education and Environmental Education	[Date]
1111	KL307	Criticism of Science Educational Periodicals	[Date]
1111	KL315	Environmental Education	[Date]
1111	SC401	Outdoor Education	[Date]
1111	AL401	Outdoor Education	[Sun]
1111	AJ401	Outdoor Education	[Sun]
1112	KL104	Instruction for Environmental Education	[Date]
1112	KL105	Special Topics on Professional Development for Science Teachers	[Date]
1112	KL307	Instruction for Environmental Education	[Date]
1112	KL308	Special Topics on Professional Development for Science Teachers	[Date]
1112	AL401	Inquiry and Practice	[Sun]
1112	AJ401	Inquiry and Practice	[Sun]
1101	KL103	Environmental Education	[Sun]
1101	KL107	Theory and Practice of Science Teacher Research	[Date]
1101	KL307	Environmental Education	[Date]
1101	SC401	Outdoor Education	[Date]
1101	AJ416	Outdoor Education	[Sun]
1101	AL416	Outdoor Education	[Sun]
1102	YO103	Creative Thinking and Problem Solving	[Continuing Education - Evening Class]
1102	KL104	Instruction for Environmental Education	[Day]
1102	KL105	Special Topics on Professional Development for Science Teachers	[Date]
1102	KL305	Instruction for Environmental Education	[Date]
1102	KL306	Special Topics on Professional Development for Science Teachers	[Date]

1102	AJ415	Inquiry and Practice	[Date]
1102	AL415	Inquiry and Practice	[Sun]
1091	KL103	Environmental Education	[Sun]
1091	KL111	Theory and Practice of Science Teacher Research	[Date]
1091	KL112	Environmental Psychology	[Japanese]
1091	YR103	Creative Thinking and Problem Solving	[Continuing Education - Evening Class]
1091	KL311	Environmental Education	[Day]
1091	KL316	Environmental Psychology	[Date]
1091	AL402	Outdoor Education	[Date]
1091	AJ402	Outdoor Education	[Sun]
1092	KL107	Instruction for Environmental Education	[Date]
1092	KL108	Special Topics on Professional Development for Science Teachers	[Date]
1092	YO103	Creative Thinking and Problem Solving	[Continuing Education - Evening Class]
1092	YR103	Environmental Psychology	[Continuing Education - Evening Class]
1092	KL309	Instruction for Environmental Education	[Day]
1092	KL310	Special Topics on Professional Development for Science Teachers	[Sun]
1092	AL403	Inquiry and Practice	[Date]
1092	AJ403	Inquiry and Practice	[Day]
1092	GR964	LOHAS and Leisure	[Japanese]
1081	KL103	Environmental Education	[Date]
1081	KL108	Theory and Practice of Science Teacher Research	[Date]
1081	KL117	Environmental Psychology	[Japanese]
1081	KL308	Environmental Education	[Date]
1081	KL314	Environmental Psychology	[Date]
1082	KL107	Field Trip and Interpretation	[Date]
1082	KL108	Instruction for Environmental Education	[Date]
1082	KL109	Special Topics on Professional Development for Science Teachers	[Date]
1082	KL309	Field Trips and Interpretation Education	[Date]
1082	KL310	Instruction for Environmental Education	[Japanese]
1082	KL311	Special Topics on Professional Development for Science Teachers	[Date]
1082	AL415	Outdoor Education	[Date]
1082	AJ415	Outdoor Education	[Sun]
1071	KL103	Environmental Education	[Date]
1071	KL108	Theory and Practice of Science Teacher Research	[Date]
1071	KL115	Environmental Sociology	[Japanese]
1071	KL202	Seminar (III) / Seminar (·)	[Sun]
1071	AL507	Environmental Education	[Date]
1071	AJ507	Environmental Education	[Date]
1072	KL108	Field Trip and Interpretation	[Date]
1072	KL109	Instruction for Environmental Education	[Date]

1072	KL110	Academic Writing in Science Education and Environmental Education	[Date]
1072	KL202	Seminar (4) / Seminar (4)	[Sun]
1061	KL101	Seminar (1)	[Date]
1061	KL102	Studies in Science Education and Environmental Education	[Date]
1061	KL103	Environmental Education	[Japanese]
1061	KL108	Environmental Interpretation and Practice	[Date]
1061	KL109	Theory and Practice of Science Teacher Research	[Date]
1061	KL204	Special Topics in Cognitive Science and Science Education	[Sun]
1061	KL305	Special Topics in Cognitive Science and Science Education	[Sun]
1061	AL507	Environmental Education	[Date]
1061	AJ507	Environmental Education	[Date]
1062	KL101	Seminar (II) / Seminar (·)	[Day]
1062	KL107	Environmental Science	[Date]
1062	KL108	Instruction for Environmental Education	[Date]
1062	KL109	Academic Writing in Science Education and Environmental Education	[Date]
1062	KL116	Special Topics in Electroencephalogram and Event-Related Potential	[Date]
1062	KL307	Special Topics in Electroencephalogram and Event-Related Potential	[Date]
1051	KL102	Studies in Science Education and Environmental Education	[Date]
1051	KL103	Environmental Education	[Japanese]
1051	KL109	Environmental Interpretation and Practice	[Day]
1051	KL110	Practice in the Design of Scientific Activity	[Date]
1051	AL503	Environmental Education	[Day]
1051	AJ503	Environmental Education	[Date]
1052	KL107	Global Change and Environmental Education	[Date]
1052	KL108	Instruction for Environmental Education	[Date]
1052	KL109	Special Topics on Professional Development for Science Teachers	[Date]
1052	KL118	Special Topics on Introduction to Educational Neuroscience	[Date]
1052	KL406	Special Topics on Introduction to Educational Neuroscience	[Sun]
1041	KL102	Studies in Science Education and Environmental Education	[Sun]
1041	KL103	Environmental Education	[Japanese]
1041	KL108	Academic Writing in Science Education and Environmental Education	[Date]
1041	KL109	Instruction for Environmental Education	[Sun]
1041	SC402	Environmental Education	[Date]
1041	AJ505	Environmental Education	[Date]
1041	AL505	Environmental Education	[Date]
1042	KL106	Field Trip and Interpretation	[Date]
1042	KL107	Instruction for Local Environment	[Date]

1042	KL108	Special Topics on Chemistry (I) / Special Topics on Chemistry(I)	[Day]
1042	KL114	Special Topics in Electroencephalogram and Event-Related Potential	[Date]
1042	KL309	Special Topics in Electroencephalogram and Event-Related Potential	[Sun]
1031	KL103	Environmental Education	[Sun]
1031	KL114	Instruction for Environmental Education	[Date]
1031	KL116	Academic Writing in Science Education and Environmental Education	[Date]
1031	BT406	Environmental Education	[Sun]
1031	PH406	Environmental Education	[Sun]
1032	KL122	Field Trip and Interpretation	[Date]
1032	KL116	Theory and Practice of Science Teacher Research	[Date]
1032	KL118	Studies in Analysis of Environmental Risk Environmental Risk	[Japanese]