

## **Craft-based interventions to improve motor and cognitive health in older adults: a randomized controlled trial in Taiwan**

### **Abstract**

In today's society, traditional crafts are increasingly being replaced by mass-produced industrial products, leading to the gradual decline of craftsmanship. Fewer people are engaging with crafts, and the industry now faces serious challenges such as the aging of craftspeople and heavy reliance on imported materials, resulting in a critical risk of industrial disruption. In response, the Executive Yuan issued the *"Current Status and Development Strategies of Taiwan's Craft Culture Industry"* in 2021, with the goal of securing funding through mid- to long-term public infrastructure projects for cultural industry development. The strategy emphasizes integrating creative design, technological applications, and digital value-added services to support industrial transformation, establish a talent cultivation system, and create an integrated governmental platform. Through these measures, young crafts practitioners can be supported in participating in key activities, promoting craft-related courses, and gaining opportunities for transformation (Department of Education, Science and Culture, 2021-12-23).

According to the 2022 population projections approved by the National Development Council (NDC), which are based on changes in fertility, mortality, and migration rates every two years, Taiwan's elderly population will reach 4.68 million by 2025, accounting for 20% of the total population (NDC, 2022). This marks the nation's official entry into a super-aged society, bringing significant economic impacts. As announced by the Executive Yuan in 2017, the major economic implications of population aging include:

1. As the population ages, industrial production decreases while demand remains stable, leading to reduced savings, lower circulation rates, and insufficient capital for economic growth (NDC, 2017).
2. An increase in the old-age dependency ratio reduces investment rates, decreases labor supply, and weakens innovation capacity, prompting measures such as trade protection to safeguard the domestic labor market (NDC, 2017).

According to the Ministry of the Interior, by the end of January 2021, Taiwan's elderly population (aged 65 and above) had reached 3.804 million. Due to the dual impact of rapid population aging and declining birthrates, the aging index first exceeded 100 in February 2017, meaning that the number of elderly people had surpassed the number of children (Ministry of the Interior, 2021).

Jiang Zhen-Hong, lecturer in the Department of Elder Care Management at Chang Gung University of Science and Technology, emphasized in *Chang Gung Medical Journal* (Vol. 35) that adopting a health-promoting lifestyle is essential for healthy aging. Such a lifestyle enables older adults to experience life satisfaction and happiness, not just the avoidance of disease. The five key dimensions of a health-promoting lifestyle are:

1. **Healthy diet:** ensuring balanced intake across the six major food groups.
2. **Avoiding unhealthy habits:** such as smoking, excessive drinking, and betel nut chewing, all of which increase cancer risk.
3. **Regular physical activity:** maintaining and enhancing bodily functions through exercise and movement.
4. **Preventive healthcare behaviors:** including health checkups, vaccinations, stress management, and self-actualization.
5. **Avoiding environmental hazards:** such as exposure to germs, noise, smoke, or falls, which can significantly impact health.

This study seeks to attract more elderly participants through simple, meaningful craft projects and community care activities. During the process of handicraft-making, seniors can train fine motor coordination, and upon completing their work, gain a sense of accomplishment that fosters self-satisfaction. This, in turn, can contribute to preventive healthcare by reducing the occurrence of age-related illnesses.

In addition, this study will incorporate the Purdue Pegboard Test to examine whether there is measurable improvement in test performance before and after participating in craft courses. Through bamboo craft-making, the study aims to investigate how training both cognitive processing and manual dexterity can benefit the elderly population.

## **1. Project Content**

### **1-1 Research Background and Motivation**

Population aging refers to the phenomenon in which the median age increases due to declining birth rates or extended life expectancy. As the old-age dependency ratio rises sharply, living alone among the elderly has gradually become a common situation. According to statistics from the Ministry of the Interior in 2021, there are currently over one million households in Taiwan consisting of elderly living alone or elderly caring for other elderly. The dependency ratio reached 42.2 in 2022 and is projected to exceed 100 by 2060.

In addition, older adults not only face mobility difficulties and increased risk of injury due to physical aging, but also experience significant loneliness. According to the 2021 statistics of the Taiwan Alliance for Senior Welfare Promotion, 1.92 million elderly people in Taiwan had gathered with non-cohabiting relatives or friends less than once per month in the past year. Therefore, this study proposes that craft activities can not only embody the spirit of “lifelong learning” but also attract like-minded individuals to engage in collective participation and discussion. The cognitive stimulation during the creative process, combined with the sense of accomplishment from completing a piece of work, can greatly contribute to preventive healthcare.

Through community activities or programs organized by social work groups, crafts can be structured into courses to promote Taiwan’s craft culture. Teaching through such courses ensures the continuation of cultural heritage while also providing therapeutic and companionship effects. For example, in August 2022, the Ministry of Culture and the National Taiwan Craft Research and Development Institute (NTCRI) jointly launched the *Taiwan Green Craft Hope Project Angel Team*, which promoted a nationwide companionship initiative under the principle of “localized service and companionship.”

As part of the *Taiwan Green Craft Hope Project*, NTCRI has organized programs such as *Healing Through Craft* and *iFull Craft*, serving as pilot projects. These have been implemented across 13 locations in Nantou, Taichung, Chiayi, and Tainan, offering a total of 74 craft courses. The programs have successfully attracted additional craft practitioners, and course information is now available online, with activities spread across different regions of Taiwan.

Director Zhang Ren-Ji of NTCRI stated that Taiwan faces an unavoidable aging trend. While world-class medical resources provide comprehensive physical healthcare, there remains a lack of psychological healing and care. Crafts, by stimulating multiple senses, can enhance cognitive functions and hand dexterity. Beyond the accomplishment of completing a work, the interpersonal interaction and companionship throughout the process can further satisfy emotional needs and bring a sense of happiness. Therefore, although there is not yet scientific proof that crafts directly benefit the elderly, from the perspective of preventive medicine, they can indeed have significant effects.

## **1-2 Research Objectives**

Based on the above background and motivation, this study adopts craft-based experiential activities to enhance the hand functions of the elderly. The specific objectives are as follows:

1. To organize craft groups, design craft experience courses, and provide opportunities for hands-on participation.
2. To plan community care activities and evaluate participants' physical and mental conditions through pre- and post-course assessments.
3. To collect feedback from the participants, analyze issues encountered, and make necessary adjustments.

Through bamboo weaving craft courses, this study aims to increase the participation of older adults, achieving both community care and memory enhancement effects. Furthermore, by incorporating the Purdue Pegboard Test, data can be collected and analyzed to determine whether such activities enhance elderly participants' motor abilities and sensory stimulation, thereby contributing to disease prevention.

## **2. Literature Review**

### **2-1 Trends in an Aging Society**

According to the Ministry of the Interior (2022), Taiwan will officially enter a super-aged society by 2025. Taiwan first became an aging society in 1993 and transitioned into an aged society in 2018. Projections indicate that the proportion of the elderly population will continue to rise, surpassing 30% by 2039 and reaching 43.6% by 2070. This demographic shift underscores the urgency of developing sustainable strategies to address the health, social, and cultural needs of older adults.

### **2-2 Sub-Health and Aging**

The concept of "sub-health" refers to a state between health and illness, in which individuals experience noticeable physical and psychological discomfort without clear structural or metabolic abnormalities. The World Health Organization (WHO) has repeatedly emphasized the importance of addressing sub-health conditions, particularly as they are prevalent among aging populations. Promoting preventive health strategies that integrate lifestyle, social engagement, and cultural participation is considered critical in mitigating these risks.

### **2-3 Craft Integration in Community Care**

In response to the challenges of aging and community revitalization, numerous local organizations in Taiwan have introduced craft-based programs as part of social care initiatives. For instance, the Nantou Pottery Association has spearheaded efforts to revive traditional ceramics, while community associations in Ren'ai, Zhongliao, and Guoxing townships have developed programs in weaving, pottery, and indigo dyeing. These initiatives not only preserve cultural heritage but also provide residents with

vocational skills, strengthen community cohesion, and foster sustainable local industries.

Similarly, the Zhulin Community Development Association in Lugu Township has combined bamboo and tea industries with cultural tourism, while the Yongfu Community has integrated ceramic training into agricultural transformation projects. Other examples, such as the Niuwie Rural Development Association and the Caoxiedun Local Culture Association, demonstrate how crafts can serve as a vehicle for environmental sustainability, cultural transmission, and intergenerational learning.

Collectively, these cases illustrate how the integration of crafts into community development not only preserves traditional knowledge but also provides therapeutic, social, and economic benefits. Such evidence supports the premise that incorporating craft-based activities into elder care programs can enhance cognitive function, motor skills, emotional well-being, and community belonging among older adults.

### **3. Research Design**

#### **3-1 Research Process**

The study will be conducted in five sequential stages:

1. **Preparatory Work:** Selection of teaching site, course content, schedule, and registration forms.
2. **Participant Recruitment:** Enrollment of older adults aged 60–90 through poster campaigns in designated communities.
3. **Pre-Test Assessment:** Administration of the Purdue Pegboard Test to collect baseline data and categorize participants into simple, intermediate, and advanced groups.
4. **Instructional Phase:** An eight-week program with six instructional hours per week, combining technical training and in-class observation.
5. **Post-Test and Data Analysis:** Comparison of pre- and post-test results to evaluate program effectiveness.

Outreach and promotion will focus on community care centers in Nantou and the Caotun Craft Development Association.

#### **3-2 Participant Recruitment**

A total of 45 participants will be recruited, with approximately 15 individuals assigned to each group according to their baseline test results. The recruitment strategy emphasizes voluntary participation from older adults in local communities, ensuring

inclusivity and accessibility.

**3-3 Instructor and Bamboo Weaving Techniques**


The program will be led by **Ms. Hsiu-Feng Lin**, a senior craftsperson with extensive expertise in traditional bamboo weaving. Her teaching covers both functional bamboo crafts (e.g., containers, baskets) and artistic or installation-based works, highlighting the integration of form, technique, and color.

The instructional content focuses on three traditional Taiwanese bamboo weaving methods (Taiwan Bamboo Association, 2021):

- **Square Weave (Simple Group):** A basic over-under weaving technique producing a checkered structure resembling green bean cakes.
- **Hexagonal Weave (Intermediate Group):** Creates hexagonal and triangular openings, forming a repeating star-like pattern with dynamic light and shadow effects.
- **Pinwheel Weave (Advanced Group):** A complex, decorative weave characterized by spiral and floral motifs, offering greater visual richness.

Each technique will be taught to one group of 15 participants, allowing progressive levels of challenge while accommodating varying physical and cognitive abilities.

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Group	Content / Skills Progression	Expected Products
A	<div>1. Square weave practice</div> <div>2. Square weave flower basket</div> <div>3. Square weave bamboo tray</div> <div>4. Square weave carrying basket</div>	

B	<ol style="list-style-type: none"> <li>1. Hexagonal weave practice</li> <li>2. Hexagonal weave bamboo basket</li> <li>3. Hexagonal weave interlaced carrying basket</li> </ol>	
C	<ol style="list-style-type: none"> <li>1. Pinwheel weave practice</li> <li>2. Pinwheel weave bamboo tray</li> <li>3. Pinwheel weave carrying basket</li> </ol>	

### 3-4 Dexterity Assessment

The study targets retired older adults aged 60–70, aiming to evaluate the effects of craft-based activities on both physical and psychological well-being. Specifically, participants will engage in bamboo weaving courses, with manual dexterity measured before and after the intervention using the **Purdue Pegboard Test (PPT)**. Comparative analysis of pre- and post-test results will provide insights into the effectiveness of craft activities in enhancing fine motor skills among older adults.

The Purdue Pegboard Test was originally developed in 1948 by Dr. Joseph Tiffin, an industrial psychologist at Purdue University. Since its inception, it has been widely applied in occupational psychology to assess both fine and gross motor coordination, particularly in tasks requiring manual precision. The test has also been used in vocational evaluation, clinical rehabilitation, and occupational therapy to measure hand, finger, and arm dexterity, with established normative data across different age groups and professions.

The assessment consists of two main components:

1. **Peg Insertion Task** – Participants insert pegs into holes using the right hand, left hand, and both hands, each within 30 seconds.
2. **Assembly Task** – Participants place a sequence of pegs, collars, and washers into holes, requiring bilateral coordination.

Scoring is based on five indices, each tested three times with average values recorded as the final score:

1. Right hand performance (30 seconds)
2. Left hand performance (30 seconds)
3. Both hands performance (30 seconds)
4. Combined total of right, left, and both hands
5. Bimanual assembly task (60 seconds)

This standardized measure allows for quantitative evaluation of changes in hand coordination, dexterity, and fine motor control, thereby serving as an appropriate tool for assessing the therapeutic potential of bamboo craft activities in older adults.

#### **4. Implementation Period and Expected Benefits**

This study centers on bamboo weaving courses as the primary intervention, aiming to evaluate their impact on the physical and psychological well-being of older adults. By collecting pre- and post-intervention data, the study seeks to determine whether participation in craft activities can indirectly enhance motor skills, hand dexterity, and cognitive function, thereby providing evidence for preventive health strategies.

Throughout the program, participants engage in both instruction and hands-on practice, stimulating brain function and fine motor coordination. Integration with community care initiatives ensures that the activity also fosters social engagement, emotional support, and companionship for older adults. Completing craft projects provides a tangible sense of achievement, while simultaneously promoting awareness of the benefits of traditional crafts and their therapeutic potential.