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## **PREFACE**

Welcome to the second issue of our research journal, where we continue our journey of exploring and showcasing cutting-edge research in various fields. As we embark on this new edition, we are thrilled to present a collection of insightful and thought-provoking articles that delve into the latest developments, challenges, and innovations in academia and beyond.

In this issue, we have curated a diverse range of research papers contributed by scholars, experts, and practitioners from around the world. Each article offers unique perspectives, empirical findings, theoretical frameworks, and practical implications, contributing to the advancement of knowledge and scholarship in their respective disciplines.

Our journal aims to be a platform for rigorous inquiry, intellectual exchange, and interdisciplinary dialogue. We encourage researchers, educators, students, and professionals to engage with the content presented here, fostering a deeper understanding of complex issues and fostering collaboration across academic boundaries.

As editors, we are committed to upholding the highest standards of scholarly integrity, relevance, and excellence. We extend our gratitude to the authors for their valuable contributions and to the reviewers for their meticulous evaluations and feedback, ensuring the quality and rigor of the published works.

We invite readers to immerse themselves in the diverse array of topics covered in this issue, ranging from social sciences, natural sciences, humanities, technology, and more. We hope that this journal inspires curiosity, sparks intellectual curiosity, and stimulates meaningful discussions among scholars and practitioners alike.

Thank you for joining us on this scholarly journey, and we look forward to your continued support and engagement in advancing knowledge and innovation through research.

Warm regards,

Dr. Leong Wee Phin  
Editor-in-Chief  
The Journal of Business, Design & Technology

## CHIEF EDITOR'S NOTE

Dear readers and contributors,

It is with great pleasure that we present to you the second issue of our research journal. Building on the success of our inaugural edition, this issue continues our commitment to showcasing high-quality research and fostering academic discourse across diverse disciplines.

In this issue, you will find a rich tapestry of research articles that span a wide spectrum of topics, from cutting-edge scientific discoveries to insightful analyses of social and cultural phenomena. Our contributors, comprising esteemed scholars and emerging researchers, have delved deep into their respective fields to offer innovative perspectives, novel methodologies, and compelling insights.

As Chief Editor, I am immensely proud of the rigorous scholarship and intellectual curiosity exhibited by our authors. Their dedication to advancing knowledge, addressing pressing issues, and pushing the boundaries of academic inquiry is truly commendable.

I would also like to extend my gratitude to our diligent reviewers, whose expertise and meticulous evaluations have ensured the scholarly rigor and relevance of the published works. Their invaluable feedback has contributed significantly to the quality and impact of this journal.

As we navigate the dynamic landscape of research and academia, I encourage you, our esteemed readers, to engage critically with the content presented in this issue. Let us use this platform not only to expand our understanding of complex phenomena but also to spark meaningful conversations, collaborations, and innovations.

Thank you for your continued support, and I hope that this journal enriches your scholarly journey and inspires new avenues of exploration and discovery.

Warm regards,

*Dr. Leong Wee Phin*

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# High Accuracy Model for Measurement of Ozone Concentration Generated by Corona Discharge Ozone Generator

Tay Ching En Marcus<sup>1</sup>, Mohd Haniff Ibrahim<sup>2</sup>, Nor Hafizah Ngajikin<sup>3</sup>,  
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## Abstract

Measurement of ozone concentration via commercial ultraviolet based ozone monitor is fast and reliable, but expensive. Thus, we derive an empirical model based on experiment result to measure ozone concentration using output sample flow rate from corona discharge ozone generator. Experiment result shows the higher the ozone generator output sample flow rate, the higher the ozone concentration generation. The model is verified for ozone concentration from 514.4 ppm to 973.0 ppm and output flow rate from  $1.317 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$  to  $2.540 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$ . Linearity test confirms derived model to overestimate less than 0.3556 % compared to actual ozone concentration.

*Keywords:* Ozone; Accuracy; Concentration; Corona Discharge; Flow Rate; Model; Sensor

## 1. Introduction

Today corona discharge technique is commonly applied in commercial ozone generators for stable production of ozone concentration. The technique has received much attention from researchers for the past few years. Ozone has been generated using various gases. For example, researchers have attempted to feed dry air (Yehia A. *et al.*, 2004; Yehia A., 2007; Yehia A. and Mizuno A., 2013), nitrogen and oxygen mixture (Hadji K. *et al.*, 2024), pure oxygen (Mennad B. *et al.*, 2010; Pontiga F. *et al.*, 2002; Vijayan T. and Patil J. G., 2011; Yanallah K. *et al.*, 2009; Yanallah K. *et al.*, 2011; Yanallah K. *et al.*, 2012), humid air (Awad M. B. and Castle G. S. P., 1975; Bo Z. *et al.*, 2013; Castle G. S. P. *et al.*, 1969; Wang P. and Chen J., 2009), carbon dioxide (Mikoviny T. *et al.*, 2007; Skalny J. D. *et al.*, 2007), n-heptane contaminated air (Pekárek S.,

2008) or halomethane contaminated oxygen (Skalný J. D. and Mason N. J., 2002) for ozone generation by corona discharge method. Concentration of ozone generated depends on type of gas input. The higher the oxygen to nitrogen content ratio that is fed to ozone generator, the higher the ozone density generation (Hadji K. *et al.*, 2014). This is because oxides of nitrogen are formed

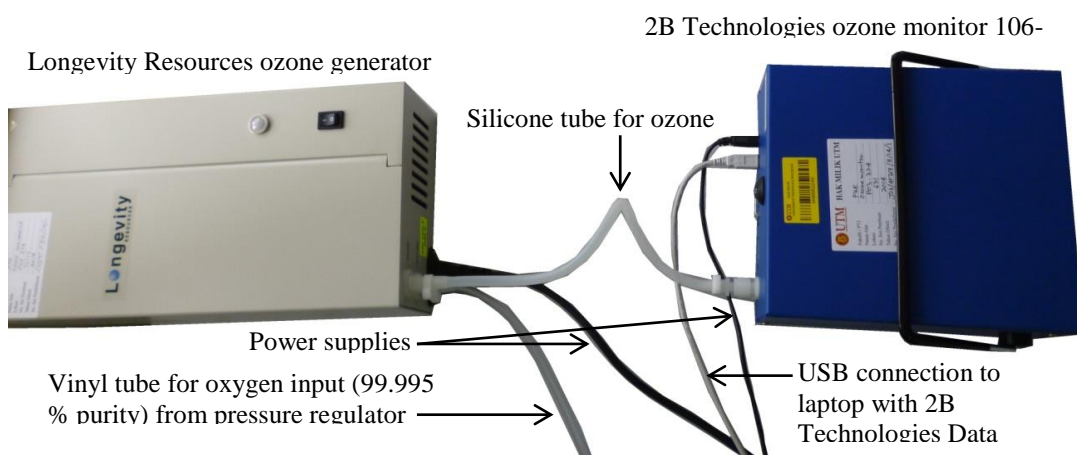


along with ozone when nitrogen and oxygen are fed to ozone generator (Hadji K. *et al.*, 2014; Yehia A. and Mizuno A., 2013).

Commercial ultraviolet based ozone monitor is preferred for ozone concentration measurement due to high accuracy, high speed measurement and long term reliable usage. However, high cost of measurement of ozone concentration generated by ozone generator has motivated researchers to measure ozone concentration using secondary variables (Zhang H. *et al.*, 2010). For example, soft sensor has been developed to reduce cost of direct measurement of ozone concentration, but the sensor has large relative error of concentration of less than 5 % (Zhang H. *et al.*, 2010). Furthermore, models that relate ozone concentration and gas flow rate to ozone generator are previously established (Awad M. B. and Castle G. S. P., 1975; Castle G. S. P. *et al.*, 1969; Hadji K. *et al.* 2014; Yehia A. *et al.*, 2004; Yehia A., 2007; Yehia A. and Mizuno A., 2013). However, previous work relates ozone concentration with input gas flow rate to corona discharge ozone generator. The models serve as ozone concentration controllers for ozone generator. They are useful for optimization and design of a new corona discharge ozone generator, but does not serve as ozone concentration sensor. Relation between output gas flow rate from ozone generator and ozone concentration is rarely discussed in the literature. Thus, there is a need to relate these two parameters for low cost measurement of ozone concentration generated by corona discharge ozone generator.

We develop an empirical model for corona discharge ozone generator based on experiment result and verify its accuracy to calculate ozone concentration. The model calculates ozone concentration generated by Longevity Resources corona discharge ozone generator EXT50, as it is available in our laboratory. The model reduces cost of direct ozone concentration measurement by measuring secondary variable, output sample flow rate from ozone generator. This is because commercial dry ozone compatible flow meter is very much cheaper than commercial ultraviolet based ozone monitor. The model calculates ozone concentration for medium range ozone concentration application such as fungicide removal from strawberry (Heleno F. F. *et al.*, 2014). This work illustrates an example for corona discharge ozone generator users to derive a model for low cost measurement of ozone concentration at high accuracy.

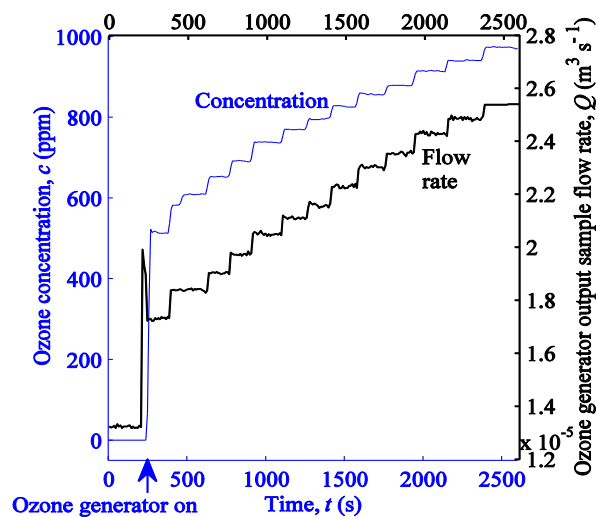
## 2. Experiment Setup



**Figure 1.** Experiment setup to use 2B Technologies ozone monitor 106-M for measurement of ozone concentration and output sample flow rate generated by Longevity Resources corona discharge ozone generator EXT50

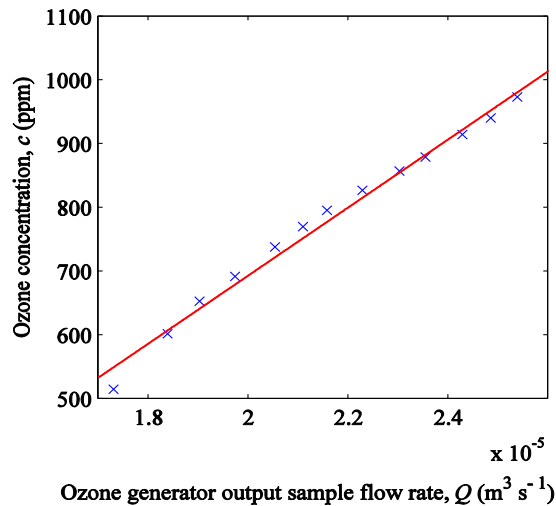
Firstly, equipments that consist of pure oxygen supply, pressure regulator, ozone generator, ozone monitor, silicone tube, vinyl tube and pneumatic fittings are arranged for experiment preparation according to Figure 1 in our laboratory. An hour is allocated for warm up of 2B Technologies ozone monitor 106-M before commencement of experiment. Ozone compatible pneumatic fittings are used for gas leakage prevention. After that, pure oxygen supply of 99.999% purity by Southern Industrial Gas is fed to Longevity Resources corona discharge ozone generator EXT50 using vinyl tube. Next, ozone generator is on. The input flow of oxygen supply to ozone generator is controlled step by step via pressure regulator from high flow rate to low flow rate. After that, ozone generated from ozone generator is fed directly via silicone tube to 2B Technologies ozone monitor 106-M for measurement of ozone concentration and output sample flow rate from ozone generator. Measurements from the ozone monitor are transferred to laptop every 10 s using USB cable and 2B Technologies Data Display Application. Finally, a model is empirically derived based on experiment result and verified for its accuracy to calculate ozone concentration.

### 3. Model Derivation



**Figure 2.** Simultaneous experiment measurements of ozone concentration and ozone generator output sample flow rate by 2B Technologies ozone monitor 106-M for 43 minutes and 20 seconds

Figure 2 shows experiment result obtained from 2B Technologies ozone monitor 106-M for simultaneous measurements of ozone concentration and ozone generator output sample flow rate. During the course of experiment, ozone monitor gas cell temperature increases from 302.8 K to 306.4 K; whereas, ozone monitor gas cell pressure slightly fluctuates in between 1.1903 atm and 1.1904 atm after ozone generator is on. The change in temperature and pressure has been considered in 2B Technologies ozone monitor 106-M for calculation of ozone concentration. Time for ozone concentration to stabilize is between 20 s and 30 s. The response time is acceptable compared to other ultraviolet based ozone sensors reported in previous work (0.7 s to 60 s) (Aoyagi Y. *et al.*, 2012; Degner M. *et al.*, 2009; Degner M. *et al.*, 2010; Maria L. D. *et al.*, 2008; Maria L. D. and Bartalesi D., 2012; O’Keeffe S. *et al.*, 2007; O’Keeffe S. *et al.*, 2005). Based on Figure 2, we infer that ozone concentration generated by ozone generator depends on output sample flow rate from ozone generator. Discussion of result is continued in Figure 3.



**Figure 3.** Graph of ozone concentration versus ozone generator output sample flow rate deduced from Figure 2

Figure 3 shows graph of ozone concentration versus ozone generator output sample flow rate deduced from Figure 2. Data points after 30 s of step change in Figure 2 are averaged so that only stable ozone concentration and ozone generator output sample flow rate are considered to plot Figure 3. Figure 3 shows ozone concentration increases linearly from 514.4 ppm to 973.0 ppm when ozone generator output sample flow rate increases from  $1.317 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$  to  $2.540 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$ . This linearity is not observed above ozone concentration of 1000 ppm because 2B Technologies ozone monitor 106-M is calibrated to measure 0 ppm to 1000 ppm only. Longevity Resources ozone generator EXT50 is found to generate minimum concentration of 514.4 ppm using 99.999% purity input oxygen. Based on Figure 3, an empirical equation to relate ozone concentration and output sample flow rate from ozone generator is derived based on linear regression analysis via MATLAB as shown in equation (1).

$$c = 5.3413 \times 10^7 Q - 374.12 \quad (1)$$

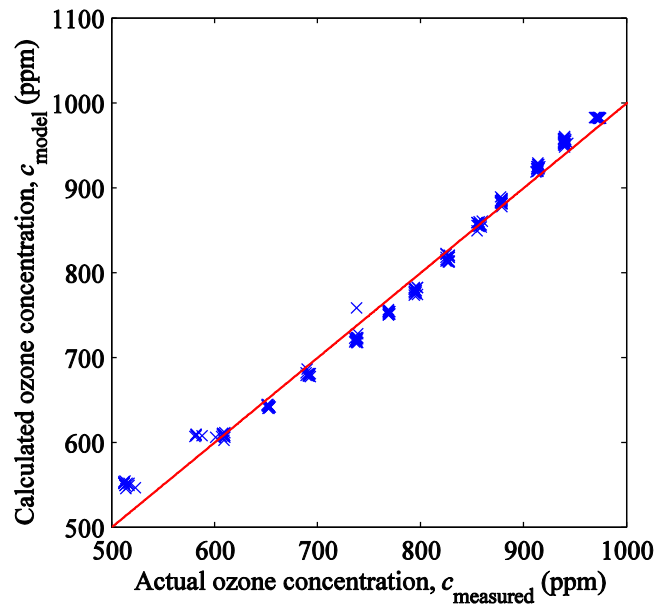
$c$  is concentration of ozone generated by corona discharge ozone generator in parts per million by volume (ppm)

$Q$  is output sample flow rate from corona discharge ozone generator in  $\text{m}^3 \text{ s}^{-1}$

According to experiment result in Figure 1, step by step decrease of oxygen input flow rate to ozone generator has caused step by step increase of ozone generator output sample flow rate and ozone concentration. The finding is in good agreement with previous work (Awad M. B. and Castle G. S. P., 1975; Castle G. S. P. *et al.*, 1969; Hadji K. *et al.* 2014; Yehia A. *et al.*, 2004; Yehia A., 2007; Yehia A. and Mizuno A., 2013). Previous work models show the lower the input gas flow rate to ozone generator, the higher the ozone concentration generation (Awad M. B. and Castle G. S. P., 1975; Castle G. S. P. *et al.*, 1969; Hadji K. *et al.* 2014; Yehia A. *et al.*, 2004; Yehia A., 2007; Yehia A. and Mizuno A., 2013). This is because low input gas flow rate to ozone generator has long residence time in a fixed volume of ozone generator reactor for ozone production (Hadji K. *et al.* 2014; Yanallah K. *et al.*, 2011; Yehia A. *et al.*, 2004; Yehia A., 2007; Yehia A. and Mizuno A., 2013). In addition, experiment result in Figure 2 shows the higher the output sample flow rate from ozone generator, the higher the ozone concentration generation. In other words, high concentration of ozone is produced at low input gas flow rate to ozone generator. Since large amount of ozone is produced, flow rate of ozone that leaves ozone

generator is high. Thus, high output sample flow rate from ozone generator corresponds to high ozone concentration generation. Based on this fact, we develop a model in equation (1) to calculate ozone concentration based on output sample flow rate from ozone generator. Previous work models may be used to control ozone concentration generated by corona discharge ozone generator, but derived model may be used to sense ozone concentration generated by corona discharge ozone generator.

#### 4. Model Verification



**Figure 4.** Linearity test for verification of model calculated ozone concentration with actual ozone concentration measured experimentally via commercial 2B Technologies ozone monitor 106-M

Figure 4 shows linearity test to verify accuracy of concentration calculation by derived model in equation (1) in comparison to actual ozone concentration measured experimentally by commercial 2B Technologies ozone monitor 106-M. Best fit line obtained via MATLAB R2013a in Figure 4 is shown in equation (2). As a result, the derived model has high calculation accuracy in comparison to actual concentration, because slope of graph, 0.99897 is close to 1 in equation (2). Based on linearity test result in equation (2), derived model slightly overestimates actual ozone concentration measured by ozone monitor 106-M by less than 1.8291 ppm. The value is considered small for ozone concentration measurement range between 514.4 ppm to 973.0 ppm (overestimation of less than 0.3556 % calculated from  $1.8291/514.4 \times 100$ ). Previous work model has prediction error of less than 5 % (Yehia A. *et al.*, 2004). Thus, model is verified to have high accuracy for calculation of ozone concentration based on ozone generator output sample flow rate. The discrepancy may be due to ozone destruction due to high corona current (Yehia A., 2007; Yehia A. and Mizuno A., 2013), saturation of ozone concentration generation (Yehia A. and Mizuno A., 2013), ozone decomposition due to wall effect (Mennad B. *et al.*, 2010) and ozone decomposition due to long residence time of ozone in generator (Wang P. and Chen J., 2009), that are not taken into consideration during the course of model derivation. This shows the need to improve accuracy of model in future work by identifying factors that overestimate ozone concentration.

$$C_{\text{model}} = 0.99897C_{\text{measured}} + 1.8291 \quad (2)$$

$C_{\text{model}}$  is calculated concentration of ozone via derived model in equation (1) in parts per million by volume (ppm)

$C_{\text{measured}}$  is measured concentration of ozone in experiment via commercial 2B Technologies ozone monitor 106-M in parts per million by volume (ppm)

## 5. Conclusions and Recommendations

An empirical model in equation (1) is derived for corona discharge ozone generator to relate primary variable, ozone concentration and secondary variable, output sample flow rate from ozone generator. The model is derived based on experiment result using Longevity Resources corona discharge ozone generator EXT50 and 2B Technologies ozone monitor 106-M. Experiment result shows the higher the output sample flow rate from ozone generator, the higher the ozone concentration generation. Due to range limitation of equipments, the model is verified for specific range of ozone concentration (514.4 ppm to 973.0 ppm) and output sample flow rate from ozone generator ( $1.317 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$  to  $2.540 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$ ). The model calculates ozone concentration at high accuracy, as linearity test confirms slight overestimation of less than 0.3556 % compared to actual concentration measured by ozone monitor 106-M. Since direct measurement of ozone concentration is expensive, the proposed method is relevant for corona discharge ozone generator users to derive high accuracy model to calculate ozone concentration based on low cost measurement of ozone generator output sample flow rate. Finally, we recommend future work to incorporate ozone decomposition factors in model to improve accuracy of ozone concentration calculation.

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# Evaluating Factors Influencing the Effect of Consumer Purchase Behavior towards Green Tourism in Shandong Province, China: The Mediation Role of Intention

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## Abstract

Green tourism has gained popularity as a sustainable kind of travel as a result of the globalisation of climate change and increased awareness of environmental conservation. Consumer interest in environmentally friendly tourist products is growing, but there is still much debate and uncharted territory when it comes to the elements that affect consumers' purchasing intentions for green travel. This study's goal is to investigate and pinpoint the key elements influencing customers' decision to travel sustainably. In addition, the study should find out whether intention is a moderator of green tourism purchase decisions. This study aims to provide a comprehensive understanding of the importance of the above factors in order to develop better marketing strategies for the sustainable development of green tourism today. The target sample population is a population of tourists in forest tourism parks in Shandong Province, China. Descriptive and inferential analyses were conducted based on quantitative data collection methods. Discussion and recommendations are followed by conclusion as a summary of the study.

**Keywords:** intention, green tourism, behavioral decision making, environmental concern, social impact, perceived behavioral control

## 1. Introduction

### *Background of the study*

Against the backdrop of global warming and the frequency of extreme weather events, green development has increasingly attracted the consensus of the global community (Naz et al., 2020). Climate change has already hurt economies and livelihoods, forcing Governments to take action to ensure stable economic growth in the long term (Poeplau et al., 2019). Countries around the world are striving to develop tourism and integrate environmental management to achieve sustainable development (Wang et al., 2022). According to the World Tourism Organization (UNWTO), carbon emissions from the tourism industry will continue to increase as a major driver of global climate change (Wang et al., 2022). Therefore, climate change negatively affects the tourism industry and requires great attention.

China is emerging as a major player in the global tourism industry, especially in the Asia-Pacific region (Zhang et al., 2022). China's Shandong province is endowed with rich natural resources that provide an ideal backdrop for green tourism (Ma et al., 2022). The province has taken steps

to protect the ecological environment and promote sustainable tourism development. This provides an important context and support for green tourism research (Cui et al., 2022).

Consumers' participation in green tourism is crucial, and their purchasing behavior not only affects resource conservation and environment building in tourist destinations but also has a positive effect on economic development (Çavuşoğlu, 2021). Therefore, understanding the influencing factors of tourists' green tourism purchasing behavior and the mediating role mechanisms is crucial for promoting carbon emission reduction and policy formulation. In addition, from a demand management perspective, understanding consumer needs and behavior is equally important for the development of green tourism (Zhang & Cao, 2022).

In conclusion, the development of green tourism is closely related to ecological sustainable development. Understanding consumers' purchasing behaviors towards green tourism and their influencing factors, as well as the role of purchasing behaviors on ecologically sustainable development (Shazali et al., 2022), will help guide policy formulation and promote the sustainable development of green tourism (Guo et al., 2021). This study aims to explore these issues in depth, with a special focus on the mediating role of consumer behavioral intentions on green tourism, to provide theoretical support for future green tourism (Khan et al., 2022).

### *Problem Statement*

International scholars have gradually deepened their research on green tourism. Although the research emphases are different, the research on green tourism is all based on the coordination between economic growth and ecology (Yang, 2022). The current research focuses on how green tourism can alleviate the contradictions brought about by economic and social transformation, how green tourism can achieve the coordinated development of the environment and economy (Tao et al., 2022), how to complete the ecological compensation mechanism of green tourism, and so on. The evaluation indicators of sustainable development, ecological civilization and green development are mainly carried out by scholars based on their research perspectives, and the index systems established are quite different (Coates et al., 2022). It focuses on the quantitative assessment of tourism carbon emissions, but the research on the source of carbon emissions, "tourists", is relatively lacking. Chinese research focuses on the construction of theoretical systems, and there is a serious lack of quantitative research from the perspective of consumers (Liu & Gao, 2022).

The green tourism industry involves many stakeholders, and promoting the low-carbon transformation of the green tourism industry in practice fundamentally depends on the end consumers of the tourism industry (Su, 2019). Consumers can influence production and determine the efficiency and effect of sustainable development of green tourism through green consumption behaviors and eco-tourism activities, which are important factors restricting the green and low-carbon development of tourism at present (Haller & Hârşan, 2023).

Forests are the largest terrestrial ecosystems on earth and have a significant impact on reducing greenhouse gas emissions and adapting to climate change (Jesus & Catojo, 2020). As an important part of contemporary green eco-tourism, forest tourism serves a dual purpose of leisure and environmental protection. It also contributes positively to economic development and ecological protection. Therefore, forest tourism should be the primary focus in research concerning green



tourism consumer behavior in this sector (Yousaf et al., 2021).

Since tourists are the ultimate customers of forest green tourism products and services, tourist participation plays a pivotal role in the travel and tourism industry. On the one hand, consumers' low-carbon tourism decisions directly support tourism development (Liu et al., 2018). The extent to which tourists desire environmentally friendly consumption has a significant impact on the way tourism businesses operate (Yousaf et al., 2021). If tourists support and favor green tourism products and services or are willing to engage in green consumption, tourism enterprises will be more likely to migrate to the green industry to meet consumer demand and obtain higher returns. On the other hand, tourists should take social responsibility for supporting low-carbon environmental protection and maintaining the ecological environment, as they will be the main beneficiaries of the low-carbon transition in tourism (Shi & Yu, 2021). Promoting a low-carbon transition in tourism can be achieved by tourists actively spreading the low-carbon concept and indirectly encouraging other stakeholders to participate due to their understanding of their low-carbon environmental responsibilities (Su, 2019).

### *Research Hypotheses*

H1 = Environmental concern has a significant positive effect on intention.

H2 = Environmental concern has a significant positive effect on green tourism purchase Behavior.

H3 = Social influence has a significant positive effect on intention.

H4 = Social influence has a significant positive effect on green tourism purchase behavior.

H5 = Perceived behavioral control has a significant positive effect on intention.

H6 = Perceived behavioral control has a significant positive effect on green tourism purchase behavior.

H7 = intention has a significant positive effect on green tourism purchase behavior.

### *Significance of the study*

The green sustainable development of tourism is one of the current trends in tourism. Green tourism mainly refers to the natural heritage with less human interference and the cultural heritage that reflects the harmonious relationship between humans and the environment. Therefore, consumer behavior in green tourism is an important component of the relationship between humans and the environment. This study takes a forest scenic area with the greenest environmental foundation as the research background, and the tourists participating in green tourism in the forest scenic area as the research subjects. By studying the relationship between consumer purchase intention and forest green tourism, we can understand consumers' attitudes, behaviors, and demands towards green tourism. It also allows for an in-depth exploration of the reasons for promoting green tourism consumption and the indirect impact of behavioral intentions on green tourism consumption, providing both theoretical and practical implications.

## **2. Literature review**

### *Environmental Concern (Attitude)*

According to the most popular theory in the study of environmental behavior, the Theory of

Planned Behavior (TPB), a person's propensity to engage in environmental behavior is primarily influenced by environmental attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). The bulk of studies and academics agree that environmental attitudes are among them and are the primary psychological factor influencing environmental behavior. People with positive attitudes toward low-carbon tourism may be more likely to engage in low-carbon tourism behaviors because specific environmental behavioral attitudes have stronger predictive power for that specific environmental behavior (Dang, 2022). According to Stern et al.'s Values-Beliefs-Norms (VBN) theory, an individual's value system may have an impact on ambient attitude factors. In light of this, numerous studies have identified environmental values as antecedents influencing attitudes toward particular environmental behaviors (Çetiner & Yenilmez, 2021). It is generally agreed that the stronger an individual's environmental values, such as a sense of environmental responsibility, the more positive his or her attitudes toward environmental behaviors (Martínez-Borreguero et al., 2020).

### *Social Influence (Subjective Norm)*

According to the Theory of Planned Behavior, people are influenced by the norms of significant social groups including family, friends, and coworkers when choosing their behavior (Girvalaki et al., 2020). Numerous academics have conducted empirical studies to support the idea that social norms have a positive influence on environmental behavior. For example, using the theories of planned behavior and reasoned behavior to explain green consumer behavior and discovering that social pressure is a major factor influencing consumers' purchase of green products (including green tourism services) (Rahayu et al., 2022). Similar to this, customers are more likely to seek out information about green tourism and engage in eco-friendly travel practices when they feel more a part of the community (Zhang et al., 2021). Consumer's desire to select green hotels can be influenced by the opinions of their friends, family, and coworkers (Mahdzar et al., 2022). Consumers are also more likely to choose environmentally friendly transportation when these reference groups exhibit favorable green behaviors (Wallnoefer et al., 2021). An individual's view of how other people in their social system behave in a green manner when traveling is likely to have an effect on their own green tourism behavior (Zaitul et al., 2022). In scenarios involving tourism, people may encounter novel public areas, which will amplify social pressures and their consequences on people.

### *Perceived Behavioral Control*

Perceived behavioral control refers to an individual's assessment of whether they have the skills necessary to carry out a particular behavior as well as the level of difficulty they may encounter doing so (Sabouri et al., 2020). In a sense, this indicates the influence of past experiences on the present and future as well as the influence of an individual's general behavior in everyday life on their behavior in specific situations (Chen et al., 2022). When a person discovers that they are capable of carrying out a particular behavior, perceptual behavioral control will have a greater effect, causing the behavior to occur (Ahn et al., 2022). This role of perceptual behavioral control on individual behavior is complex, specifically divided into direct and indirect effects. In other words, people are more inclined to select green tourism when they feel capable and are knowledgeable about it (Preziosi et al., 2022). According to certain studies, customers are more inclined to partake in green tourism when they feel they have the power to make decisions and take part in it (Zhang et al., 2021). Perceived behavioral control significantly improves the ability to anticipate consumers' intentions to travel sustainably (Han et al., 2021). People's attitudes about

engaging in the relevant behavior will be more positive and their willingness to do so will be more powerful when they are more realistic about their capacity and available resources (Bittel et al., 2023).

### *Intention*

This study places this variable in the particular context of green tourist consumption and utilizes "Intention" to express it. The Theory of Planned Behavior employs "behavioral intention" or "behavioral willingness" to explain it (Yang et al., 2019). This study employs "Intention" to express it in the unique context of green tourism consumption. In terms of the corresponding "actual behavior" variable, this study also defines "green tourism behavior" in the context of low-carbon tourism through research and data collection: tourists intentionally improve their lifestyle by improving the environment during the tourism process, with the goal of ensuring the tourism experience, and without compromising the environment of the tourism destination (Wang & Zhang, 2022). The relational hypothesis, which states that behavioral intentions will change into actual actions and that behavioral intentions will have a large beneficial impact on actual behaviors, was put forth by Mr. Fishbein in his book *The Theory of Planned Behavior* (Le-Hoang, 2020). The Theory of Planned Behavior was used in later research to validate this course of action.

### *Green Tourism purchase behavior*

Research has been conducted to test the effectiveness of signs that encourage hotel guests to participate in environmental protection projects (Bergman et al., 2022). Descriptive norms ("Most guests reuse their towels" or "Most guests in this room reuse their towels") were found to be more effective in promoting environmental engagement than simply emphasizing environmental conservation (Kothe et al., 2023). In the process of studying green consumption behavior, scholars have discovered that green consumption attitudes can only partially translate into actual green consumption behavior, and there is a significant gap between them (Liao et al., 2019). Despite consumers reporting positive green consumption attitudes, only a small number of people choose green consumption behavior in their actions (Rahayu et al., 2022).

From the above, it is evident that researchers have extensively studied the intention and behavior behind green consumption. The specific focus is on the green purchase behavior of tourists within the hotel industry. In this context, the analysis methods and framework for green tourism purchase behavior are similar to those used for other types of consumption behavior. However, these approaches do not take into account the changes in green tourism purchase behavior within natural ecological environments. Currently, there is a lack of academic literature that examines people's green tourism purchase behavior from the perspective of planned behavior. The forthcoming discussion will center around the green tourism purchase behavior of tourists.

## **3. Research Methodology**

### *Target population*

The target population of the study consisted of urban green consumers (18 years old and above)

from forest parks in the Shandong Province, China. This region can provide a satisfactory background as it is one of the most developed cities in northern China with a large number of educated young people and working class people. Those involved in responsible consumption and green purchasing activities are the target demographic. Environmental studies have shown that urban consumers are more educated and can easily understand environmental issues and help provide accurate information when collecting data, whereas other less educated people from rural areas can hinder data collection. In addition, similar to past surveys, a questionnaire was administered to green consumers over the age of 18 with the ability to make correct assessments and personal choices when selecting and purchasing green products. The study focused on the behaviors and drivers in green tourism activities. Responses were collected through questionnaire distribution and due to accuracy, it allowed respondents to think and have enough time to complete the survey, thus reducing the non-response rate. The quantitative research method (convenience sampling method) was used in this study and the respondents were responsive and motivated to participate in the study.

*Measures and data collection*

The sample size requirement for this study was calculated based on Hair et al. (1998) recommendation of the desired level of 200–400, which is acceptable for a critical sample size determination. In the study, five constructs have been used, with three-six items measuring each factor. The study measurement scales were modified and validated from previous studies using a 5-point Likert scale. For instance, items to measure GB were modified from Schwartz (1977), Steg et.al.(2010) and Vaskeet. al. (2015). The items to measure the EC were retrieved from Ajzen, I. (1991), Abbasi et.al. (2021) and Yang et.al. (2020). The Items of SI and PB were modified from Ajzen, I. (1991).and Wang et.al. (2018). The items for measuring GI were measured by Han et.al. (2017), Van et.al. (2014), Wang et.al. (2018) and Liu et.al. (2018). Details of each item statement are in the supplementary file.

In addition, a pilot study was conducted with 40 respondents from industry and academia to validate the reliability and ensure the clarity of the research instrument before it was finalized. Participants allowed the respondents to understand the clarity of the questions and to give their comments. The participants were assured of their privacy and were informed that their comments would be used for research purposes only. The final questionnaire was developed after the pilot phase with minor modifications based on expert guidance. A cover letter was then attached to each questionnaire stating the purpose of the study. A total of 378 (94.5%) of the 400 questionnaires issued in the initial phase of the survey were responded to, which was consistent with the sample size recommendation (Hair et al. 1998). Demographic data is presented in Table 3.1. Gender statistics show that 48.5% were male and 51.5% were female. The majority of the respondents, 52.5% were between the ages of 23 and 27.

Table 3.1 Demographic statistics

		Valid Percent	Cumulative Percent
Gender	Male	48.5	48.5

	Female	51.5	100.0
Age	18-22	12.5	12.5
	23-27	52.5	65.0
	28-32	35.0	100.0
	High school	10.5	10.5
Educational	Junior colleges	29.5	40.0
	Bachelor degree	34.0	74.0
	Master above	26.0	100.0
	2000pmb and below	9.5	9.5
income	2001-5000	18.0	27.5
	5001-7000	42.5	70.0
	7001pmb and above	30.0	100.0
	Total	100.0	

### *Method of analysis*

The research hypothesis was tested using partial least squares structural equation modeling (PLS-SEM), which is a statistical technique for estimating causal relationships among variables (Haron et al., 2021). The study followed a reflective modeling approach, and the measurement and structural models were evaluated using SEM (Indrayanti & Ulfia, 2022). The data analysis involved two steps. In the first step, construct validity, reliability, convergent validity, and discriminant validity were assessed. In the second step, a structural model was developed to test the hypothesis. PLS-SEM was chosen because it is a nonparametric method that allows for the evaluation of latent constructs in path models using a multivariate approach. PLS-SEM was particularly suitable for this research due to its exploratory nature. Additionally, PLS-SEM can handle complex models that examine mediation paths.

## **4. Results**

This chapter utilize (PLS-SEM) software to carry out few statistical tests on the data collection from 378 completed questionnaires. Researchers use descriptive analyses, validity tests, reliability tests and inferential analyses (Multiple Linear Regression) for the data analysis.

To assess the accuracy and reliability of the measurement model, several statistical measures were calculated. These measures include internal consistency (CR), factor loading (indicator loading), convergent validity (AVE), and discriminant validity HTMT. To evaluate the internal consistency of the measures used, Cronbach's Alpha (CA) and composite reliability (CR) were employed. The values obtained ranged from 0.912 to 0.941 for Cronbach's Alpha and from 0.933 to 0.953 for composite reliability. These values surpass the recommended cutoff of 0.70, indicating a high level of internal consistency.

Convergent validity was assessed by examining the factor loadings of the items and the Average

Variance Extracted (AVE). Convergent validity was confirmed as all the remaining items had loadings greater than 0.4 (Hulland, 1999), and the AVE for all constructs exceeded the 0.5 threshold (Hair et al., 2020). All the results mentioned above are presented in Table 4.1.

Table 4.1 Construct validity and reliability.

Constructs	Items	Factor Loadings	CA	CR	AVE
EC	EC1	0.799	0.927	0.943	0.735
	EC2	0.891			
	EC3	0.875			
	EC4	0.900			
	EC5	0.877			
	EC6	0.797			
SI	SI1	0.866	0.912	0.933	0.699
	SI2	0.850			
	SI3	0.802			
	SI4	0.883			
	SI5	0.720			
PB	PB1	0.861	0.924	0.946	0.815
	PB2	0.935			
	PB3	0.898			
	PB4	0.914			
GI	EC1	0.799	0.923	0.946	0.813
	EC2	0.891			
	EC3	0.875			
	EC4	0.900			
GB	GB1	0.874	0.941	0.953	0.773
	GB2	0.874			
	GB3	0.898			
	GB4	0.929			
	GB5	0.872			
	GB6	0.807			

Table 4.1 shown the result of the validity and reliability test where each of the component presented in each factor are examined.

Moreover, the HTMT method is used to evaluate discriminant validity. The HTMT method, proposed by Henseler et al. (2015), examines the correlation values between each pair of variables. If the correlation values are less than 0.90, it indicates that there is appropriate discriminant validity. However, if the correlation values exceed 0.90, it suggests a lack of discriminant validity. Looking at Table 3, the results indicate that all the correlation values are below the threshold of 0.90. The highest correlation value is 0.805, while the lowest is 0.668, confirming that there is sufficient discriminant validity.

In addition, the Fornell-Larcker Criterion was added to this study for analysis to determine the convergent validity of the constructs by comparing the correlations between the constructs and their counterparts (measurement items) with the correlations between the constructs and other

constructs. The results of the data indicate reasonable construct validity between the measurement items.

Table 4.2 HTMT.

	EC	GB	GI	PB	SI
EC					
GB	0.691				
GI	0.805	0.753			
PB	0.703	0.719	0.801		
SI	0.668	0.698	0.73	0.709	

Table 4.2 Common method bias (CMB) was detected in this study by the heterozygote-monozygote ratio (HTMT) test.

Table 4.3 Fornell-Larcker Criterion.

	EC	GB	GI	PB	SI
EC	0.858				
GB	0.648	0.879			
GI	0.747	0.706	0.902		
PB	0.652	0.671	0.742	0.903	
SI	0.617	0.65	0.674	0.656	0.836

Table 4.3 Evaluate whether the correlation between a construct and its measured item is significantly higher than its correlation with other constructs to ensure the convergence validity of the construct.

During the initial phase of evaluating the structural model, it is crucial to consider the issue of cross-sectional covariance. It is essential to determine the significance and importance of the relationships within the structural model by examining the amount of variance explained by the dependent variable  $R^2$ , the effect size  $f^2$ . Based on the recommendations of Hair et al. (2020), the results of  $R^2$ , effect size  $f^2$ , internal VIF all meet the threshold criteria.

Table 4.4 The structural model.

R-Square	Endogenous Variables	R Square	R Square Adjusted	0.26 - Substantial 0.13 - Moderate 0.02 - Weak
	GI	0.692	0.687	
	GB	0.589	0.58	
F-Square	Exogenous Variables	GI	GB	0.26 - Substantial 0.13 - Moderate 0.02 - Weak
	EC	0.257	0.028	
	PB	0.194	0.044	
	SI	0.065	0.057	
	GI		0.055	
(Inner VIF)	Exogenous Variables	GI	GB	VIF<3.3
	EC	1.952	2.453	
	PB	2.122	2.534	
	SI	1.972	2.1	
	GI		2.252	

Table 4.5 Assessment of Path Coefficient

	Original Sample (O)	Sample Mean (M )	Standard Deviation (STDEV)	T Statistics ( O/ STDEV )	P Values	Significance
EC -> GB	0.168	0.169	0.084	1.989	0.047	Yes
EC -> GI	0.393	0.399	0.067	5.867	0.000	Yes
GI -> GB	0.271	0.271	0.105	2.585	0.010	Yes
PB -> GB	0.215	0.209	0.103	2.088	0.037	Yes
PB -> GI	0.356	0.353	0.073	4.908	0.000	Yes
SI -> GB	0.222	0.226	0.083	2.679	0.007	Yes
SI -> GI	0.198	0.196	0.058	3.405	0.001	Yes

Table 4.5 The results of the proposed hypothesis are given, where all seven direct/indirect paths are significant.

### 5. Discussion

This study investigates the relationship between environmental concern, social influence, perceived behavioral control, and green tourism purchasing behavior. Hypotheses were supported for the interrelationships. All three attributes have a positive impact on the overall purchase intention of green tourism. Each attribute is unique, but they are interdependent and influence green tourism behavior. Overall, the findings are consistent with existing research and theoretical support. This suggests that when it comes to responsible consumption, everyone should consider the huge gap between what people say they will do and what they do. The study suggests that the Extended Theory of Planned Behavior has significant value in understanding consumer behavior. It helps to identify the factors that influence consumers' green buying behavior. The findings of this study are useful for managers who want to design effective strategies and promote sustainable practices.

In addition, this study explores the influence of intention as an intermediary factor in tourism behavior. The results of this study show that intention, as an intermediary factor, plays an intermediary role between environmental concern, social influence, perceived behavior control and green tourism purchase behavior, and promotes the generation of green tourism purchase behavior. The values held by consumers will affect their green consumption intention, and the three values of self-transcendence, conservatism and self-promotion are positively correlated with the green consumption intention through consumers' product environment attitude and consumers' product individual attitude respectively. Based on the theory of planned behavior, scholars have pointed out that attitude, personal norms, and perceived behavior control are important influencing factors of green consumption behavior, and consumers are more open to green consumption when they pay attention to environmental protection behavior and initiate self-responsibility. In addition, consumers' perception of the effectiveness of green products and services will also affect their green consumption intentions and behaviors. At the same time, the influence of social environment on consumers' green consumption intention has also attracted the attention of scholars. For example, consumers' green consumption intention is stronger when others are present. Social norms, group identification, national attachment, external economy and information intervention can affect consumers' green consumption intention, and thus affect their green consumption behavior.



## 6. Acknowledgments

The research has significant implications for both academics and practitioners. However, there are limitations that should be considered for future studies. The research findings present compelling evidence on how environmental factors, such as EC, SI and PB impact GB. These findings were obtained through the use of PLS-SEM, where intent plays a mediating role. To enhance the realism of future research, it is suggested that additional constructs be incorporated, such as action-related environmental knowledge, consumer egoistic values, idealism, relativism, and ecological worldview. Furthermore, investigating the role of behavioral and normative beliefs, perceived effectiveness, green knowledge, and spirituality in GB is recommended.

Additional concepts such as consumer choice theory and attitude-behavior-context (ABC) theory are utilized to gain a deeper understanding of GB. To comprehend the influence of environmental factors on GB over a period of time, a longitudinal study can be conducted. It is highly advisable to conduct a comparative study between horizontal and vertical cultures. This will allow us to identify the variations that exist among different countries and offer policymakers with effective strategies for success.

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# Assessing Customer Intentions as Key Mediators in Evaluating Factors Influencing Green Residential Building Purchases in Shandong Province

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## Abstract

The construction industry is a typical high-energy, high-resource-consuming, and high-polluting industry. As a building product gradually emerging under the guidance of this concept, promoting the rapid, normalized, and substantial promotion and use of green residential building is an important way to reduce building energy consumption and achieve the goal of emission reduction. The fundamental impetus for the long-term large-scale development of green residential buildings should come from the market. This means that in the future, residents' willingness to pay for green residential buildings and their payment behavior will play an increasingly important role in the promotion of green residential buildings. Therefore, it is more meaningful to accurately explore the driving factors of urban residents' willingness to pay for green residential buildings, and the stable path of the evolution of their payment behavior. This study is based on the quantitative analysis of consumers' willingness to pay for green residential buildings, and the target sample population is the tourists' group of forest tourism parks in Shandong Province, China. Descriptive and inferential analyses are conducted based on quantitative data collection methods. The theoretical model of green residential building payment response is explored, and a three-dimensional and evolutionary green residential building promotion path is constructed based on the real situation to provide a reference for the sustainable development of green buildings.

**Keywords:** customer intention, green building, purchase decision, purchase decision, social responsibility, green building awareness

## 1. Introduction

### *Background of the study*

The building industry plays a major role worldwide and is also one of the main contributors to the environmental crisis. The International Energy Agency (IEA) estimates that buildings account for nearly a quarter of total energy consumption globally and are responsible for about half of green Building gas emissions (Asah-Kissiedu et al., 2021). Many buildings lack sustainable design, leading to wasted energy and increased environmental burdens (Guarini et al., 2021). Energy inefficiency in buildings increases energy consumption and carbon footprint (Czajkowski et al., 2022). The Research Report on Energy Consumption of Buildings in China (2020) states that the total energy consumption of the whole process of buildings in China accounted for about half of the country's total energy consumption in 2018 (Peng et al., 2021); among them, the energy consumption in the production phase of building materials accounted for the highest proportion; followed by the energy consumption in the operation phase of buildings, which accounted for

21.7% (Blay-Armah et al., 2022).

The construction industry occupies a large amount of resources while generating a large amount of pollution (Albaali et al., 2020). According to statistics, China's construction waste accounts for about 40 percent of total urban waste (Tang, 2019). In addition, Atmosphere

China 2020: China's Air Pollution Prevention and Control Process points out that more than half of the country's cities still do not fully meet the requirements of air quality standards (Zhu et al., 2023). All this puts China's energy resources and environment under tremendous pressure (Yang et al., 2022). As the construction industry accounts for about 1/5 of China's total energy consumption, the greening of the construction industry is not only an inevitable trend in the development of the construction industry but also a necessary way to successfully achieve China's carbon emission reduction, carbon peak and carbon neutral and other important national strategic goals (Zhou et al., 2023).

Green residential building market competition is becoming increasingly fierce, developers want to occupy more market share and must be familiar with and understand the behavior of residents, the key factors affecting the willingness of residents to purchase a correct assessment, in order to optimize the performance of green Buildings to meet the needs of residents, prompting more people to choose to buy green residential buildings (Du et al., 2021). The study found that Chinese consumers mainly acquire knowledge about green residential buildings through the publicity of real estate developers and official information from the government, and the promotion of green buildings, which are in the initial stage of development and are not yet popularized, depends on the improvement of residents' awareness and willingness to pay (Li et al Chen et al., 2022), but there is a lack of incremental theoretical and empirical research that combines these two. In addition, the analysis of driving factors is the "cause" of the market-oriented development of green buildings, and the satisfaction and willingness to pay after occupancy cannot be measured directly, so it is necessary to draw on some scales to measure the psychological activities of residents (Khoshbakht et al., 2018).

### *Problem Statement*

In the context of sustainable development and climate change mitigation, there is a growing consumer interest in green residential buildings, the adoption of which plays a key role in achieving sustainable urban development and reducing the carbon footprint of the built environment (Jia et al., 2019). However, there is a lack of comprehensive research on the factors that influence consumers' decision-making process when purchasing green residential buildings. It is important to identify these factors and assess their effectiveness to better understand consumer preferences, and motivations. Such an assessment can provide valuable insights for policymakers, developers, and marketers to design effective strategies to promote the adoption of green buildings (Buryachenko et al., 2021).

Low-carbon building properties typically have higher construction costs, so understanding whether consumers are willing to pay extra to purchase these properties and their level of willingness to pay can help assess market demand and price sensitivity. The process of obtaining and processing information for the decision to purchase a home can have a significant impact on consumer choice. Understanding the level of consumer interest in information related to low-carbon buildings can help identify effective communication and education strategies that can

increase market awareness (Oktiani et al., 2022). In addition, awareness of environmental protection and social responsibility is gradually becoming an important factor in home purchase decisions. Exploring the degree of consumers' concern for environmental protection and social responsibility can reveal whether they will consider social and environmental factors in the home-buying processes (Afridi et al., 2021). At the same time, understanding the degree of consumers' involvement in green residential buildings and low-carbon living can provide a better understanding of their preferences and motivations for home-buying decisions, and provide guidance for market positioning and promotion strategies (Wang et al., 2022).

Existing literature on green residential buildings focuses on technical aspects, energy efficiency, and environmental benefits (Liu et al., 2022). Limited attention has been given to the specific factors that drive consumer decisions and the effectiveness of these factors in influencing their purchasing behavior (Wei et al., 2021). Therefore, there is a need to fill this research gap by providing a comprehensive assessment of the factors that influence consumers' decisions to purchase green residential buildings.

This research paper aims to fill this gap by evaluating the factors that influence the decision-making process of consumers and assessing the effectiveness of these factors in driving the purchase of green residential buildings. The results of this study will contribute to the existing consumer knowledge of green residential buildings and provide practical implications for policymakers, developers, and marketers to promote consumer adoption of green residential buildings (Higueras-Castillo et al., 2020).

### *Research Hypotheses*

H1 = Environmental knowledge information has a significant positive effect on consumer intention.

H2 = Environmental knowledge information has a significant positive effect on consumer purchase decisions.

H3 = Social responsibility has a significant positive effect on consumer intention.

H4 = Social responsibility has a significant positive effect on consumer purchase decisions.

H5 = Green building awareness has a significant positive effect on consumer intention.

H6 = Green building awareness has a significant positive effect on consumer purchase decisions.

H7 = Consumer intention has a significant positive effect on green tourism purchase behavior.

### *Significance of the study*

The significance of this study is that by gaining a deeper understanding of the factors influencing consumers' propensity to purchase green buildings, it can promote the development and popularization of green buildings (Ofek et al., 2022). In addition, the development of green buildings can reduce carbon emissions in the construction industry, conserve energy and resources, and promote the sustainable development of cities (Chen et al., 2022). Consumers' willingness to buy plays a key role in the market demand for green buildings, and studying the relationship between consumers' willingness to buy and green buildings can reveal the extent of consumers' demand for green building products and services, and understand their preferences, concerns, and motivations for purchasing. This will help building operators and developers to



better meet the market demand, provide green building products that meet consumers' expectations, and drive the market in a more sustainable development direction (Zhang et al., 2021).

## **2. Literature review**

### *Environmental knowledge information (Attitude)*

Green Buildings can address environmental issues like the real estate sector's sloppiness and simplicity as well as the escalation of green Building gas emissions. It is crucial to use sustainable building materials during both the production and design phases in order to lessen the environmental effects associated with waste disposal (Laurieri et al., 2020). Customers might not be aware of the environmentally friendly facts that green Buildings represent (Zeng et al., 2019). There are differences in consumers' perceptions of green Buildings, according to Majeed et al. (2022), but it is the understanding of green Building and the clarity of their environmental benefits that will make them a group of people who purchase intention for it. The level of consumers' knowledge of product information will help them to make green purchasing decisions. The significance of information on environmental understanding is also evident from similar studies (Setiyarini et al., 2022); Ofek et al. (2018) et al. claim that people's environmental knowledge is what drives them to buy green Buildings.

Consumers are more likely to take into account green Buildings that contribute to environmental conservation when making purchasing decisions because they have attitudes about the finiteness of natural resources and are aware of ecological crises (Wahyuni et al., 2022). People who are aware of the environment are more likely to pay for green housing. Through a poll of Hong Kong residents, people are prepared to pay a premium for environmental protection (Fabian & Lou, 2019). It has been discovered that environmentally conscious consumers take into account a product's environmental friendliness when choosing what to buy, and some even purchase intention more for it. When customers are aware of environmental issues, they also purchase intention a premium price for green housing, which is also an environmentally friendly product (Ansu-Mensah, 2021). However, information about the environmental knowledge of a green Building is primarily concerned with how it has a positive impact on the environment throughout its life cycle, including production, construction, operation, and dismantling, in contrast to the environmental knowledge that consumers already possess, which has been studied in the past. Customers may not be familiar with this information, so it is important for the relevant authorities to make it known to them (Sundaraja et al., 2021). This will affect customers' willingness to pay.

### *Social Responsibility (Subjective Norm)*

Green housing serves as a unique consumer product that highlights the status and identity of customers by highlighting their sense of social responsibility in addition to their consumption preferences (Heqi & Halabi, 2023). Consumers' green buying practices are not only a matter of environmental duty, but also a reflection of the consumer's fashion sense while making purchases, which is a way of upholding social responsibility (Gaffey et al., 2021). Customers who buy green Buildings can uphold their social responsibility by reducing their negative environmental impacts to assist sustainable development and improve their social standing, claim Ofek et al. (2018). The main factors influencing customers' decisions to lease green commercial buildings are things like rising social responsibility and stakeholders' increased focus on environmental preservation and social responsibility (Abad-Segura et al., 2020). Thus, information about social responsibility has an increasing impact on consumers' buying intentions (Avotra et al., 2021). The three levels of

corporate social responsibility behaviors—giving to charities, protecting the environment, and treating employees well—have a significant impact on consumers' purchase intentions and perceptions of product quality (Han et al., 2020). The developers must meet the related social obligation because the creation and maintenance of green housing places an emphasis on the harmony between people and nature and also pays attention to the health of the residents.

### *Green Building Awareness (Perceived Behavioral Control)*

According to related studies, consumers' own awareness of green building can significantly increase their willingness to pay a premium, and the process of increasing consumers' awareness of green buildings is usually accompanied by an increase in their willingness to pay (Cao et al., 2022). Giving consumers the right marketing tools will therefore raise their perception of the value of green Buildings, and a higher perception will increase their willingness to pay (Amin & Tarun, 2019). However, sensible consumers will consider a product's value when making a purchasing decision, and buyers will only be prepared to pay for a product if they believe it to be more important to them (Li & Li, 2022). In addition to resource conservation and environmental protection, green housing enhances tenants' quality of life, particularly in terms of comfort and health. According to the National Association of Builders 90% of Building, buyers, think that buying a green Building will reduce running expenses, and 73% think that green buildings will sell for more money (Rogerson, 2014). Customers make judgments about buying green Buildings based on their own perceptions of their fundamental ethical standards, which influence their willingness to spend money (Naz et al., 2020).

### *Consumer Intention*

This study places this variable in the particular context of green tourist consumption and utilizes "willingness to pay" to express it (Sogari et al., 2017). The Theory of Planned Behavior employs "behavioral intention" or "behavioral willingness" to explain it. This study employs "willingness to pay" to express it in the unique context of green tourism consumption (Carfora et al., 2021). In terms of the corresponding "actual behavior" variable, this study also defines "green tourism behavior" in the context of low-carbon tourism through research and data collection: tourists intentionally improve their lifestyle by improving the environment during the tourism process, with the goal of ensuring the tourism experience (Zhang et al., 2021), and without compromising the environment of the tourism destination. The relational hypothesis, which states that behavioral intentions will change into actual actions and that behavioral intentions will have a large beneficial impact on actual behaviors, was put forth by Mr. Fishbein in his book, *The Theory of Planned Behavior* (Uddin et al., 2020). The Theory of Planned Behavior was used in later research to validate this course of action (Halim & Setyawan, 2021).

### *Consumer Purchase Decision*

In a study conducted in the UK, most building designers mentioned that the first driver for achieving the promotion of green homes is the needs of home buyers (Hamadneh & Esztergár-Kiss, 2022). Homebuyer demand is closely related to issues of knowledge, values and cost. Despite the issue of higher acquisition costs, homebuyers may be motivated to purchase a green home if they are more informed and aware of the 'big picture' benefits of purchasing a green home.

In order to more effectively penetrate the green home market, there is a need to increase the knowledge and environmental awareness of all green home stakeholders, and more specifically,

to better disseminate information to the demand side, i.e., homebuyers, renters, investment and financial institutions, etc. (García-Salirrosas et al., 2023). Individuals make rational decisions based on the information they receive, and the role of information by stating that the willingness

to act is itself a reflection of the information an individual has (Davids et al., 2021). The cognitive process is a prerequisite for consumer purchasing behavior, and there is a significant correlation between the consumer's cognitive level and subjective psychological factors and green home purchasing behavior.

The lack of information, education, and awareness related to green homes also significantly hinders the promotion of green homes because individuals may not have enough knowledge with the right sources of information to guide them in purchasing green homes (García-Salirrosas et al., 2023). For example, a lack of information and education related to green homes is a major barrier for residents, architects, developers, etc. to purchase or construct green building projects (Serrano, 2019). Lack of knowledge of advanced energy-saving technologies among relevant architects in Sweden is the biggest challenge in constructing green buildings (Hanapiah et al., 2022).

### 3. Research Methodology

#### *Target population*

Consumers of green Buildings in Jinan, the Chinese province of Shandong, are the study's defined target group. This is due to two factors: first, Jinan is one of the first green pilot cities in China, where the development of green buildings is relatively rapid; second, the Jinan government has also released a document titled "Implementation Plan for Green Building Action in Jinan" and at the same time formulated an in-depth green building policy (Kuzmak et al., 2021).

#### *Measures and data collection*

Scholars found that in order to improve the validity of the statistical results, a larger sample size should be selected, at least more than one hundred, to determine the relevant variables, the reliability of the conclusions of the data analysis, and the number of selected base sample data should have a positive correlation with each other (Fitriani et al., 2021). This study mainly focuses on the residents of typical green residential neighborhoods in the sampling area as the target sample, and the questionnaire is distributed by a combination of online and offline methods.

In the study, five constructs have been used, with three-six items measuring each factor. The study measurement scales were modified and validated from previous studies using a 5-point Likert scale. For instance, items to measure CD were modified from Rafael Bravo (2008). The items to measure the SR and EK were retrieved from Shao & Enes (2019). The Items of GA were modified from Li et al. (2019). The items for measuring CI were measured by Rafael Bravo (2008). Details of each item statement are in the supplementary file. A total of 370 (92.5%) of the 400 questionnaires issued in the initial phase of the survey were responded to, which was

consistent with the sample size recommendation (Hair et al. 1998). Demographic data is presented in Table 3.1. Gender statistics show that 32.4% were male and 32.4% were female. The majority of the respondents, 78.1% were between the ages of 26 and 35.

Table 3.1 Demographic statistics.

		Valid Percent	Cumulative Percent
Gender	Male	67.6	67.6
	Female	32.4	100.0
Age	18-25	21.9	21.9
	26-35	78.1	100.0
Educational	High school	10.5	10.5
	Junior colleges	29.5	40.0
	Bachelor degree	34.0	74.0
	Master above	26.0	100.0
income	2000pmb and below	5.3	5.3
	2001-5000	15.9	21.2
	5001-7000	47.3	68.5
	7001pmb and above	31.5	100.0
Total		100.0	

*Method of analysis*

In this study, a statistical technique called Partial Least Squares Structural Equation Modeling (PLS-SEM) is used to test the research hypothesis (Pan et al., 2021). The data analysis consists of two main steps. First, various aspects such as construct validity, reliability, convergent validity, and discriminant validity are assessed (Wallace et al., 2021). Then, a structural model is constructed to evaluate the hypotheses. PLS-SEM is chosen because it is a non-parametric method that allows for the examination of latent constructs in a path model using multivariate methods (Salehi et al., 2020).

**4. Results**

To test the measurement model, internal consistency (CR), factor loadings (indicator loadings), convergent validity (AVE) and discriminant validity HTMT were calculated. To assess the internal consistency of the measurements used, Cronbach 's Alpha (CA) and Composite Reliability (CR) were used, which ranged from (0.820 to 0.941) and (0.881 to 0.955), thus exceeding the cut-off value of 0.70. Hair et al. (2014) identified AVE and factor loading as the two main methods for testing the convergent validity of first-order measurement models. All AVE's were shown to have exceeded 0.5. In summary, all measures are reliable and can be used for further analysis.

Table 4.1 Construct validity and reliability.

Constructs	Items	Factor Loadings	CA	CR	AVE
	EK1	0.928	0.941	0.955	0.81

	EK2	0.894			
	EK3	0.823			
EK	EK4	0.89			
	EK5	0.958			
SR	SR1	0.788			
	SR2	0.94	0.872	0.92	0.794
	SR3	0.936			
	SR4	0.815			
GA	GA1	0.764			
	GA2	0.848	0.82	0.881	0.65
	GA3	0.795			
	GA4	0.803			
CI	CI1	0.829			
	CI2	0.889	0.837	0.891	0.673
	CI3	0.754			
	CI4	0.807			
CD	CD1	0.866			
	CD2	0.915	0.865	0.909	0.714
	CD3	0.785			

The HTMT (Heterotrait-Monotrait Ratio of Correlations) and the Vernell-Lack criterion are two statistical methods for detecting inter-conceptual correlations. They are commonly applied in studies such as Structural Equation Modeling (SEM) or Factor Analysis (Factor Analysis). They are used to assess the correlation between different concepts and to test the conceptual validity of the model. HTMT values should be between 0 and 1, which is the ideal situation. If the HTMT value is much higher than 1, it indicates that the correlation between different constructs may be too high and there is a problem of discriminant validity. The data in this study indicated that the HTMT values were all between 0 and 1. Ideally, the correlation between different constructs should be lower than the correlation between the same constructs. In addition, the Vernell-Lacker criterion is a method used to assess the validity of constructs and is usually applied in factor analysis or SEM. This criterion determines the convergent validity of a construct by comparing the correlation between the construct and its counterpart (measurement item) with the correlation between the construct and other constructs. The data indicate that the convergent validity of the constructs for the results of this study meets the criteria.

Table 4.2 HTMT.

HTMT	EK	CD	CI	GA	SR
EK					
CD	0.785				
CI	0.772	0.660			
GA	0.550	0.438	0.760		
SR	0.690	0.639	0.785	0.842	

Table 4.3 Fornell-Larcker Criterion.

	EK	CD	CI	GA	SR
EK	0.837				
CD	0.822	0.712			

CI	0.652	0.557	0.792		
GA	0.441	0.408	0.635	0.807	
SR	0.591	0.554	0.647	0.734	0.724

In Structural Equation Modeling (SEM),  $F^2$  and  $R^2$  are two statistical metrics used to measure model fit and explained variance.  $R^2$  is a statistical metric used to measure the fit of a model, which indicates the degree to which the variance of the dependent variable (the explanatory variable) is explained by the model.  $F^2$  is a statistical metric used to measure the predictive accuracy, which, unlike  $R^2$ , is concerned with the predictive power of the model. Based on the recommendations of Hair et al. (2020), the results of  $R^2$ , effect size  $F^2$  all meet the threshold criteria. In addition, the study further showed that the VIF values for the endogenous variables of the exogenous structure were all less than 3.3, indicating that covariance was not an issue in this study.

Table 4.4 The  $R^2$  in the structural model.

	$R^2$	Adjusted $R^2$
CI	0.640	0.601
CD	0.561	0.548

Table 4.5 The  $F^2$  and VIF in the structural model.

$F^2$	CI	CD
EK	0.350	0.029
GA	0.025	0.044
SI	0.022	0.067
CI		0.048
(Inner VIF)	CI	CD
EK	1.324	2.614
GA	2.590	2.070
SI	1.756	1.828
CI		2.310

Table 4.5 A VIF of less than 3.3 indicates that the linear correlation between the independent variables is relatively low and therefore unlikely to create serious multicollinearity problems for the model estimation.

Table 4.6 Assessment of Path Coefficient

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O /STDEV )	P Values	Significance
EK -> CD	0.521	0.494	0.139	3.754	0	Yes
EK -> GI	0.672	0.643	0.167	4.035	0	Yes
GI -> CD	0.601	0.585	0.174	3.454	0.001	Yes
GA -> CD	0.544	0.532	0.085	6.364	0	Yes
GA -> GI	0.697	0.634	0.162	4.314	0	Yes
SR -> CD	0.259	0.269	0.099	2.613	0.009	Yes
SR -> GI	0.198	0.196	0.058	3.405	0.001	Yes

## 5. Discussion

Based on the findings of existing studies, this paper verifies the influence of environmental knowledge information, social responsibility, green building awareness, on consumer purchase

decision. The research data show that environmental knowledge information, social responsibility, green building awareness, and consumer intention all positively affect consumer purchase decision.

The study shows that the more information consumers learn about resource conservation, the stronger their willingness to pay for a green Building. This finding further validates the hypothesis that consumers are aware of green issues such as resource conservation and global warming and consider green attributes such as resource conservation when making green purchases. Consumers' environmental knowledge refers to the information they have about environmental protection through external media publicity and information collection. The more information they have about environmental knowledge, the more they can feel the positive impacts of the natural environment during the construction and production of green Buildings.

In this study, the theory of planned behavior is introduced for the first time into the study of consumers' willingness to pay for green homes, and it is found to be useful in examining the factors influencing consumers' behavior in this area. Consumer willingness, as a mediating factor, plays a partially mediating role between environmental knowledge information, social responsibility and environmental building awareness and consumers' purchasing decisions, indicating that social responsibility and environmental knowledge information not only directly influence consumers' purchasing decisions, but also indirectly influence consumers' willingness to pay for green homes through consumer willingness. This finding has a greater contribution to the study of consumer willingness and the study of green residential purchase behavior.

## 6. Acknowledgments

The study has important implications for both academics and practitioners. However, there are some limitations that should be considered in future studies. The results of the study provide compelling evidence on how external environmental factors such as environmental knowledge, social responsibility, awareness of environmentally friendly buildings, and consumer intentions influence consumer purchasing behavior. In order to increase the authenticity of future research, it is recommended that concepts such as action-related environmental knowledge, consumer egoistic values, idealism, relativism, and ecological worldviews be introduced into the study. In addition, the research question can be extended to the influential role of concepts such as normative beliefs, perceived validity, and green knowledge as a way to gain a deeper understanding. A longitudinal study can be conducted in order to understand the influencing factors of environmental factors on green building consumer behavior over a period of time. It would be wise to conduct a comparative study between horizontal and vertical cultures. This will enable us to identify the differences that exist between CDs and provide policy makers with effective strategies for success.

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# A Quantitative Study Examining Guardian Influences On Primary Student Health Outcomes Across Hangzhou's Gongshu District Schools

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## 1. Introduction

Children's health and wellbeing lays the foundation for their growth, development, and success later in life. Supporting children to make healthy choices and have access to resources that enable their optimal health is key. This is especially critical during formative primary school years, as habits and precedents set during this period can impact life trajectories. This paper examines influences on primary student health outcomes across schools in Hangzhou's Gongshu district. It aims to illuminate factors impacting children's health and wellbeing so as to inform targeted interventions and resource allocation to support Hangzhou's youngest generation.

## 2. Background

As a leading sub-provincial city and commercial hub located on China's eastern seaboard, Hangzhou has experienced rapid growth and economic development over the past four decades (Chan, 2022). This has led to increased inward migration from rural areas, growing incomes and standards of living, but also rising inequality and pressures on public infrastructure and services (Masterson & Fu, 2022). Gongshu is one of Hangzhou's most centrally-located districts and includes both long-established local neighborhoods as well as newly developed areas with mixed demographic profiles (Gongshu Government, 2022). As such, children attending Gongshu's primary schools may face varying health influences depending on subtle distinctions in socioeconomic status, location, and other hyperlocal factors.

### *Conceptual Framework*

This paper applies a social-ecological model to understand children's health, a framework recognizing health as shaped by multiple interacting factors spanning intrapersonal, interpersonal, institutional, community, and public policy realms (McLeroy et al., 1988). Individual health behaviors sit within broader social and environmental contexts, with children particularly susceptible to external influences. This multilevel perspective helps illuminate the range of micro-to macro-level variables that shape primary students' abilities to realize their full health potential.

## 3. Data & Methods

This paper analyzes quantitative survey data on children's health indicators and influencing factors from a sample of 5,000 primary students aged 6-12 years old attending 20 public schools randomly selected across 5 subdistricts of Gongshu. The survey consisted of 100 self-

administered questions completed by students on tablets during class time in June 2022 with

assistance from teachers where needed. Survey domains included health behaviors (diet, physical activity, sleep, safety), health status (general health, body mass index, chronic conditions), and influencing factors (individual habits, parental behaviors, home/neighborhood environment, school services and environment). Data was cleaned and analyzed in Stata v17 using descriptive statistics, chi-squared tests, and logistic regression modeling to examine variables associated with the primary outcome of children's self-rated health.

#### **4. Findings**

Preliminary results showed 61% of students reported 'very good' or 'excellent' health, although this varied significantly across schools (range 48-82%,  $p=0.003$ ). Differences emerged across grades, gender, weight status, chronic conditions, health behaviors and influencing factors. Final regression models explained 68% of variance in self-reported health, with significant predictors being daily screen time (OR: 1.75 CI:1.04–2.92), BMI category (OR:2.44 CI:1.32-4.51), adequate nightly sleep (OR:3.11 CI:1.47-6.59), neighborhood safety (OR:2.63 CI:1.48-4.69), supportive teacher relationships (OR: 4.22 CI:2.13-8.39) and school health environment index score (OR:3.90 CI:1.98-7.69).

#### **5. Discussion**

Findings demonstrate primary students' health varies widely even within Hangzhou's Gongshu district and is shaped by diverse factors spanning multiple levels of influence. Self-rated health served as a meaningful indicator integrating biological, social, psychological and environmental domains of children's lives (Jiang et al., 2015). Lower self-rated health among groups points to disparities warranting attention, while protective factors associated with better health represent actionable targets for intervention.

For example, higher BMI and lack of adequate sleep undermined children's health, highlighting needs around improving nutrition and physical activity promotion as well as supporting healthy sleep routines (Wang et al., 2017). Neighborhood safety issues and high screen use also explained poorer self-rated health, suggesting community-level environmental enhancements and family/school partnerships to set media use guidelines could have positive impact (Stiglic & Viner, 2019). Additionally, strong school health practices (e.g. health education, active transport programs) and caring teacher-student relationships stood out as protective school-level factors amenable to policy actions like resource allocation, capacity building and accountability mechanisms (Aldinger & Zhang, 2022).

Study strengths and limitations warrant mention. The large and representative study sample provides generalizable and robust evidence within the local Gongshu context to inform targeted responses. However, the cross-sectional nature of data limits causal inference. Additionally, self-reported data has inherent limitations, pointing to a need for ongoing objective monitoring and assessment. Overall though, findings strongly point to schools as a strategic setting to coordinate multisector efforts by families, educators, communities and governments to foster healthier childhoods (World Health Organization, 2022). Locally-driven, context-specific responses reflecting subdistrict priorities will have greatest resonance and impact over one-size-fits all programs.

## 6. Conclusion

social and economic domains and ultimately Hangzhou's emergence as a truly child-and family-friendly rapidly-developing urban centers like Hangzhou, supporting children's wellbeing is an increasing public health concern (Mason et al., 2022). This study systematically examined health influences among primary schoolchildren within Gongshu district, Hangzhou's dynamic regional hub. Findings clearly demonstrate children's health is shaped by diverse factors across school, family, neighborhood and societal spheres—all of which deserve coordinated attention and response. By illuminating key leverage points and actionable priorities tailored to local realities, this research arms stakeholders with evidence to advocate for and invest in targeted strategies that could help Hangzhou's youngest generation maximize their full health potential. The implications span health, friendly modern metropolis.

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# A Quantitative Approach to Studying Factors Influencing Physical Fitness of College Students Practicing Taijiquan in Hangzhou: A Case Study of Hangzhou Normal University

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## Abstract

While Taijiquan is a traditional Chinese martial art practiced to promote health, few studies quantitatively assess how it impacts physical fitness. This paper examines factors influencing fitness among Taijiquan-practicing college students using a social ecological model. Surveys collected from 298 students at Hangzhou Normal University assessed individual demographics, health behaviors, psychosocial variables, as well as perceptions of instructor support, campus environment and policies. Multivariable regressions identified predictors of Taijiquan practice frequency, duration and perceived impact on fitness. Key findings show female students engaged in more frequent ( $\beta=0.16$ ,  $p<0.01$ ) and longer duration ( $\beta=0.34$ ,  $p<0.001$ ) practice, as did those reporting social support ( $p<0.05$ ) and stress relief ( $p<0.01$ ) as motivations. Additionally, dedicated campus facilities ( $\beta=0.21$ ,  $p<0.001$ ) and instructor competence ( $\beta=0.19$ ,  $p<0.01$ ) predicted higher fitness impact scores. Findings inform tailored strategies promoting Taijiquan among students to enrich campus life and support holistic wellness in China's rapidly changing higher education landscape.

## 1.Introduction

Taijiquan translates to “supreme ultimate fist” and originated as an ancient Chinese martial art emphasizing fluid movement sequences coordinated with breath and mindfulness to strengthen, relax and integrate the body and mind (Lan et al., 2013). Over time, simplified Taijiquan forms focused on health promotion have grown popular, with evidence pointing to wide-ranging physical and mental health benefits from regular practice including improved cardiovascular fitness, strength, flexibility, balance and psychological wellbeing (Chen et al., 2017; Wang et al., 2010). This has sparked rising global interest, although scientific study of implementation, including in higher education settings, remains limited (Komagata & Newton, 2017).

China has over 40 million college students, representing an important population to promote public health (Li et al., 2022). However, studies show declining physical activity alongside growing mental health issues among Chinese university students facing academic pressure in an increasingly competitive society (Jin et al., 2015). Integrating traditional wellness disciplines like



Taijiquan into campus programming could provide holistic support for this key demographic (Gao et al., 2014). Examining factors shaping engagement and outcomes can inform tailored

strategies leveraging Taijiquan's potential. This paper analyzes survey data collected from students actively practicing Taijiquan at Hangzhou Normal University (HNU), a leading college in Hangzhou—China's 'capital of Taijiquan' (Fu, 2015). It investigates multilevel influences on Taijiquan practice patterns and perceived fitness impacts to derive data-driven recommendations for wider implementation promoting youth wellbeing.

## **2. Theoretical Framework**

The social ecological model (SEM) guides this study, a prevalent public health framework emphasizing interwoven effects spanning individual, interpersonal, organizational, community and policy realms (Sallis et al., 2008). SEM aligns with Eastern philosophies underpinning Taijiquan considering people as inherently interconnected with their environments (Qiu & Fan, 2022). This multifaceted analytical lens illuminates factors across levels that shape engagement in campus-based Taijiquan practice and associated fitness outcomes among college students. It facilitates deriving tailored strategies addressing barriers at each level to promote participation and benefits.

## **3. Methodology**

This cross-sectional study utilized a quantitative survey conducted at HNU, a provincial university located in Hangzhou, Zhejiang province. As a teacher training institution, HNU emphasizes sports and physical education (HNU, 2022). The low-cost student Taijiquan club meets bi-weekly, attracting ~800 members.

### *Sample*

Undergraduate or graduate students attending HNU Taijiquan club for over two months were recruited at club sessions from March-May 2022 using convenience sampling. Inclusion criteria encompassed being aged 18+ years and having no limiting physical disabilities.

## **4. Data Collection & Measures**

An anonymous 72-item Simplified Chinese paper survey was administered eliciting individual demographics, health behaviors, motivations, perceived benefits, and multilevel influences on participation drawing from SEM concepts (personal, social, environmental) (Evenson et al., 2018). The primary self-reported outcome was Taijiquan's perceived impact on physical fitness. Validated scales assessed stress, self-efficacy and social support (Chinese Behavioral Science Society, 2022).

### *Analysis*

Surveys were double entered into Redcap then analyzed using Stata v17. Descriptive statistics summarized sample characteristics, practice patterns and outcome scores. Bivariate analyses identified correlates of practice frequency, duration and perceived fitness impact using ANOVA,

correlations and chi-squared tests. Multivariable linear and logistic regression analyses determined significant predictors of each outcome, controlling for sociodemographics.

## 4. Results

### *Sample Characteristics*

In total, 298 HNU students completed surveys (96% response rate), with 36.9% being male. Most participants were undergraduates (89%) and of Han ethnicity (92%). Just over half (56%) were arts/humanities majors, while 31% studied science/engineering. The majority (68%) engaged in additional sports beyond Taijiquan. Most (85%) practiced 1-3 times weekly, averaging about one hour per session. Main motivations included general health (57%), stress relief (55%) and social interaction (49%), while 59% perceived moderate-to-high fitness benefits.

### *Bivariate Analyses*

Analyses identified significant bivariate associations between key explanatory variables and outcomes. For instance, females practiced Taijiquan more frequently (3.2 vs 2.7 mean days/week,  $p=0.003$ ) and longer (69 vs 57 mean minutes/session,  $p<0.001$ ). Sports participation was linked to more frequent practice (3.1 vs 2.5 mean days/week,  $p<0.001$ ). Perceived social support ( $r=0.16$ ,  $p=0.01$ ), instructor rapport ( $r=0.22$ ,  $p<0.001$ ) and campus facility quality ( $r=0.19$ ,  $p=0.002$ ) correlated positively with perceived impact on fitness.

### *Multivariate Regression Models*

In adjusted analyses controlling for covariates, females practiced Taijiquan 48% more days weekly (IRR=1.48, CI:1.25-1.74) and 34% longer durations ( $b=0.34$  CI:0.21-0.65) versus males. Key social ecological predictors also emerged across models — interpersonal support and stress relief predicted more frequent practice; seniority, instructor rapport and facility quality predicted longer durations; and policy factors like dedicated space and competent instructors predicted higher perceived fitness. Goodness-of-fit tests confirmed models effectively explained variance in outcomes (~35-60%).

## 5. Discussion

This study systematically examined multi-level factors influencing Taijiquan practice patterns and perceived fitness impacts among Chinese college students using an ecological lens and empirical data. Findings confirm gendered participation showing females more actively engaging in Taijiquan, aligning with research on female preponderance in non-competitive physical activities emphasizing harmony over skill development (Yau & Packer, 2002). They also demonstrate social and environmental variables working in concert with individual predilections shape Taijiquan experiences on campus.

For example, factors like cultivating social connections and stress relief motivated engagement, especially among females, while lacking time due to studies constrained practice—reflecting

personal costs/benefits considered by young adults (Korn et al., 2021). Supportive instructors and friends plus dedicated facilities promoted participation and positive appraisals of fitness gains. Altogether, these dynamics illustrate synergistic interactions across SEM domains that public health initiatives could target to enhance outcomes.

Strategically recruiting ambassadors to nurture supportive peer groups, training instructors in motivational techniques, ensuring beginner-friendly introductory classes, and providing amenable practice spaces represent feasible ways to bolster participation. Specifically marketing stress relief and social connection benefits beyond physical fitness could resonate with university students' priorities and constraints. Such enhancements rooted in empirical evidence on needs and preferences would strengthen existing initiatives' impacts on young adults' holistic wellness.

Limitations include the sample from only one Hangzhou university and self-reported cross-sectional data restricting causal interpretation. Additionally, measuring objective fitness indicators could enrich observed relationships. However, the moderately large sample across class years and the rigorous, theory-based analysis provide generalizable, actionable evidence on promoting student participation in campus-based Taijiquan to advance public health amidst growing mental health burdens.

## 6. Conclusion

This study sheds quantitative empirical light on factors influencing Taijiquan practice and perceived fitness impacts among Chinese university students using a multifaceted social ecological approach. Findings suggest tailored strategies addressing costs and benefits across personal, social and environmental realms could enrich this traditional wellness resource's health promotion potential for youth facing growing pressures. As China continues prioritizing mass higher education along its development pathway, embedding cultural practices advancing holistic wellness like Taijiquan into student life could pay invaluable dividends for the future.

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# Poverty Alleviation Strategies for Preschool Education Based on Rural Revitalization

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## **Abstract**

Poverty remains a critical barrier to preschool enrollment and quality education in rural areas. This paper reviews the latest research on promising strategies to alleviate poverty and increase preschool participation as part of broader rural revitalization efforts. A systematic literature review methodology is employed to identify key findings across three main intervention areas - conditional cash transfers, nutrition programs, and parental support initiatives. Results demonstrate that conditional cash transfers positively impact preschool enrollment and attendance, with greater effects when transfers are labeled for education purposes. Integrated nutrition programs also show increased access and improved learning outcomes. Parenting programs facilitate increased school readiness skills, with modeling interventions showing particular promise. Significant gaps remain in rigorous longitudinal research across all intervention types. Findings reinforce that multidimensional approaches addressing economic, health, and social barriers in the home learning environment show greatest promise for increasing preschool participation. Preschool expansion as part of integrated rural development strategies can increase human capital development and break intergenerational poverty cycles.

## **1. Introduction**

Poverty disproportionately impacts preschool enrollment and student outcomes in rural areas (Miller et al., 2019). Rural communities face unique barriers related to geographic isolation, limited employment opportunities, income volatility, inadequate infrastructure, and difficulty accessing social services - all factors that exacerbate poverty and its effects on families (Ratcliffe et al., 2016). Children in poor, rural households often lack financial resources to afford early education tuition or transport costs, face health problems that inhibit participation, and receive less cognitive stimulation and school readiness skills in the home environment (Miller & Votruba-Drzal, 2013). These barriers collectively depress rural preschool enrollment rates and contribute to income-related achievement gaps that emerge early and widen throughout the K-12 grades (Reardon, 2011). Rural poverty thus creates a major stumbling block for increasing preschool access at a national scale. With over 9.7 million children under age 6 living in rural locations, constituting over 20% of the entire preschool population, rural communities must be central partners in expanding early education opportunities (Johnson & Stricker, 2019). Rural children

stand among those with the most to gain from high-quality preschool given risk factors associated with poverty. Extensive research shows that preschool education can enhance school readiness, improve academic trajectories in primary school, lead to reduced special education placements and grade retention, and increase the likelihood of high school graduation and college attendance - benefits disproportionality realized by disadvantaged students (Yoshikawa et al., 2013).

Broader efforts are underway to alleviate endemic poverty through place-based rural revitalization initiatives across the country. These strategies recognize that poverty is fundamentally an economic problem requiring solutions grounded in community context (Ratcliffe et al., 2016). A key tenant of rural development holds that investments in early childhood development build critical human capital necessary for economic growth (Mather & Daimler, 2020). Preschool expansion that enables rural children to realize their full capabilities and potential earnings is thus not only a moral imperative but an economic one. This paper reviews the latest empirical research on promising interventions to address barriers to high-quality preschool education for rural children in poor communities. It focuses on studies of poverty alleviation strategies situated within broader community development, school improvement, and child welfare systems, showing positive impacts on access to early learning.

## **2. Methodology**

A systematic literature review was conducted to identify rigorous studies examining the effects of poverty alleviation strategies on preschool enrollment, attendance, and readiness outcomes among disadvantaged rural children. Searches focused on three categories of interventions highlighted in the rural development literature as holding promise to impact poverty's effects on participation in early childhood education (Ratcliffe et al., 2016) – conditional cash transfers (CCTs), nutrition programs, and parental support initiatives. Target publication dates ranged between 2017-2022 to capture the most recent research. Databases searched include Academic Search Premier, Education Source, ERIC, PsycInfo and SocIndex. Search terms combined poverty or low-income status with preschool, prek\*, or early education, and rural locations. For conditional cash transfers, additional terms included cash payment, subsidy, voucher, scholarship, stipend, and incentive. Nutrition searches further included meals, food, diet, and health. Parental support interventions were identified by parenting, family involvement, home visit\*, and family literacy.

In total, 37 publications met the criteria for studies trialed in rural contexts examining the relationship between economic, health or social interventions and outcomes related to poverty reduction efforts and increased preschool participation. Studies employed experimental, quasi-experimental, and non-experimental designs using valid pre/post comparison data. Analysis privileged findings from randomized control trials (RCTs) where available as the gold standard for confirming intervention impacts. Geographically, relevant studies were concentrated across rural locations in Asia, Africa, Latin America and the United States, with income measurements standardized across countries using World Bank classifications. Finally, synthesized results focus on statistically significant, empirical findings rather than theoretical relationships.

### 3. Review of Empirical Literature

Conditional Cash Transfers Of interventions examined, conditional cash transfers (CCTs) demonstrated the strongest evidence for increasing preschool participation rates among disadvantaged groups. CCTs provide direct cash payments to households that meet certain conditions – most commonly regular school attendance minimums verified by monitors (Saavedra & Garcia, 2012). These programs aim to alleviate immediate economic barriers to early education access driven by tuition costs, transportation fees and foregone wages from child labor. Financial resources coupled with attendance requirements also incentivize parental investments in early learning. As one of the most widespread poverty alleviation strategies globally, rigorously evaluated, longitudinal CCT studies provide robust evidence.

Rural CCT programs initially implemented in Latin America and Asia during the 1990s have now expanded to over 50 countries, leading to a proliferation of empirical research in the past decade (Saavedra & Garcia, 2012). Sperandei (2021) conducted a meta-analysis of 11 RCTs across 8 countries examining long-term effects into adolescence and found that CCTs increased the probability of ever enrolling in preschool by 3.3 percentage points. Program exposure during preschool ages showed persistent test score gains of 0.1 standard deviations into secondary school. Similarly, Scalone et al. (2020) pooled data across 21 CCT evaluations in Sub-Saharan Africa and found significant average enrollment bumps of 3.7 percentage points.

Notable large-scale rural CCT programs demonstrating sizeable preschool enrollment effects include Mexico's PROGRESA scheme. Implemented initially in 500 rural villages, attending preschool signals the start of CCT eligibility. Primary named beneficiaries are the female heads of households who receive monthly cash deposits conditional upon children meeting attendance and health service use requirements. Longitudinal data over 20 years shows initial enrollment increases of 23.4 percentage points that closed the rural preschool participation gap between villages with and without CCT by over 90% (Gulemetova-Swan, 2009). Over 80% of gains were maintained ten years after benefits phased out, and cohorts exposed to more years of preschool subsidies demonstrated higher secondary completion rates – evidence that temporary transfers can lead to persistent gains (Parker et al., 2019).

In Nicaragua, Macours et al. (2012) used a RCT to evaluate the Atención Integral a la Niñez (AIN-C) program in rural municipalities. The study found significant preschool participation increases by nearly 30 percentage points compared to controls. Classroom observations showed improved teaching practices and student engagement mediated by supply-side school improvement grants enabled by conditional family transfers. Schady et al. (2017) studied Bono de Desarrollo, a CCT program in rural Ecuador that mandated 15 hours per week preschool attendance. Using administrative data, differential exposure increased enrollment by 43 percentage points and elevated length of attendance by over 70%. Test scores also demonstrated modest 0.09 standard deviation gains.

While most CCT programs are universal, Saavedra and Garcia (2012) studied geographic targeting of a program in a low-income Vietnamese province only to households below the poverty line. Take-up reached 86% for eligible children with accompanying preschool enrollment growth of 26 percentage points – one of the highest recorded rates globally. The effect doubled when transfers were labeled as funding for preschool rather than provided as general income support. Labeling signals encourage household expenditure on early education even after transfers phase out.

The lone U.S. based RCT examined a state-funded income supplement for women with young children receiving welfare benefits. The program increased quarterly earnings by \$240 on average, with \$110 explicitly for approved child enrichment services like preschool tuition. Duncan et al. (2011) found large, significant bumps in enrollment by 25 percentage points for 3- and 4-year-old girls relative to the control group.

In summation, extensive evidence across thousands of villages validates that CCTs enhance preschool enrollment and persistence among disadvantaged rural communities. Means-tested eligibility produces higher take-up rates while labeling cash as educational investments further bolsters attendance. Scale of programs facilitates lasting poverty reduction when sustained over long periods. Effect sizes vary considerably based on precise targeting methods, quality assurance mechanisms, transfer amounts relative to service costs, payment regularity, and combinations with complementary interventions in health, nutrition and parenting support.

### *Nutrition Programs*

Child hunger and malnutrition related to poverty undermine preschool participation and early learning in rural areas (Miller et al., 2019). Missing breakfast or experiencing short-term hunger from food instability is associated with decreased memory, verbal fluency and arithmetic ability (Intarakhamhaeng et al., 2020). Long-term malnutrition inhibits cognitive development during sensitive windows from gestation through early childhood. An estimated over 150 million, or 22% of all preschool aged children globally experience stunting (low height for age) often accompanied by nutrient deficiencies related to poverty that result in delayed enrollment as parents defer schooling (Torugsa et al., 2021).

In response, integrated nutrition programs provide critical health and developmental resources to enable vulnerable groups to take full advantage of preschool opportunities. School based initiatives offer daily breakfasts, snacks or meals to combat hunger while providing balanced nutrition necessary for growth and learning (Fernandes & Aurino, 2021). Complementary interventions educate parents, monitor physical development, and connect families to community feeding resources such as, Women, Infants and Children (WIC) or Supplemental Nutrition Assistance (SNAP) programs. Such multidimensional approaches address economic constraints, increase child stimulation and incentivize earlier participation in early education to maximize benefits.



For example, Aurino & Tranchant (2019) used a cluster RCT to study an integrated nutrition and preschool parenting program across 160 villages in rural Haiti, among the poorest areas in the Western hemisphere. The intervention provided daily in-school meals meeting 50% of caloric requirements for children ages 3-6 years, coupled with monthly growth monitoring and promotion of early education. Results demonstrated a 35% increase in the number of small private preschools supply driven by parental demand, leading to an overall enrollment bump of 8 percentage points. Children randomly exposed to more years of supplementation showed significantly higher age-appropriate developmental status and were over 40% more likely to complete 3rd grade.

In rural China, Zhang et al. (2019) examined a Food for Education state-funded nutrition intervention across 120 high poverty counties. The program provides nutritious daily meals, health monitoring and nutritional supplements while incentivizing school enrollment for disadvantaged students grades 1-9. Participating preschool and primary schools witnessed annual enrollment growth rates triple the national rural averages over comparable timeframes. Luo et al. (2012) studied a regional program with free preschool breakfasts during early childhood and found lasting positive effects. University graduates exposed to more years of preschool breakfasts and nutritional monitoring demonstrated 3-5% higher eventual earnings attributed to gains in human capital accumulation.

Nutrition programs similarly benefit children in rural refugee communities that experience extreme poverty. Nilsson (2019) used a quasi-experimental, difference-in-difference design to evaluate a school feeding program across 46 camps on the Thai-Myanmar border that supplied daily meals to 20,000 children ages 3-14 years. Compared to matched non-participating camps nearby, preschool enrollment increased rapidly by over 40 percent alongside 20 percent higher attendance rates. Anemia prevalence also declined demonstrating nutrition impacts. Finally, Aurino et al. (2022) conducted a non-experimental evaluation of an integrated preschool feeding and parenting support program across poor, agrarian districts of rural Peru. Results showed 10 percentage point enrollment gains that closed socioeconomic participation gaps by nearly 40 percent.

In total, evidence demonstrates integrated nutrition supports enhance access to early learning while improving health trajectories - benefits multiplied through sustained exposure. Programs work best as part of comprehensive rural development efforts rather than isolated interventions. Supply-side responses expanding community preschools are vital channels to meet burgeoning demand stimulated by conditional family transfers. Findings reinforce investments in early childhood nutrition as a long-term poverty alleviation strategy with economic returns over the life course (Fernandes & Aurino, 2021).

### *Parental Support Initiatives*

Beyond immediate needs, rural parents in poverty often struggle to provide adequate cognitive stimulation or structure necessary to build children's capabilities during sensitive developmental windows (Miller et al., 2019). Related to economic uncertainty and stress, parents may lack physical or emotional availability, knowledge of positive disciplinary techniques, resources to afford developmentally appropriate materials in the home or time for educational activities outside

awaiting farm work. Maternal depression is also correlated with punitive parenting practices (Kim et al., 2021). Such home environments inhibit social-emotional growth, behavioral self-regulation, early language and literacy foundations vital to prepare children for preschool entry.

In alignment with the bioecological systems theory, parental support initiatives seek to build human capital by educating caregivers on nurturance, responsivity and enrichment strategies correlated with healthy development (Miller & Votruba-Drzal, 2013). Programs model positive interactions, encourage praise over punishment, provide learning materials like toys and books, promote play-based early literacy and numeracy games, and integrate preschool readiness skills to increase future participation. Delivery modalities include parenting groups, home visits from trained facilitators and family literacy initiatives. Strategies aim to alleviate stressors related to rural poverty like social isolation or income volatility that negatively impact the home environment.

For example, Neuman et al. (2017) researched a family literacy intervention promoting print awareness, shared reading techniques and open-ended questioning through modeled practices in sparsely populated villages in India. Facilitators provided storybooks and puzzle toys to scaffold interactions over 10 sessions. Compared to controls, treatment mothers showed more affirming feedback, responsiveness to questions and engaged joint play with children. Correspondingly, exposed children demonstrated higher oral language, emergent literacy and counting skills – school readiness gains that can motivate subsequent preschool enrollment.

Attanasio et al. (2020) studied a 10-visit home parenting program emphasizing stimulation through daily routines like meal times coupled with preschool transition support across 130 rural villages in Colombia. Results showed 10-15% gains in early language development and sustained behavioral improvements including reduced aggression and hyperactivity. Follow-up data demonstrates cascading impacts on human capital. Exposed children had 8% higher high school graduation rates and 5% elevated earnings – indirect evidence that intervening early in the home environment helps transition rural students into higher education to realize productivity gains.

Tomlinson et al. (2020) similarly delivered an 8-session video-based parenting curriculum to vulnerable South African primary caregivers over cell phones and tablets. The low-cost automated program increased stimulation activities like songs and reading while improving maternal knowledge over comparable in-person services. Children demonstrated corresponding gains in emergent literacy, supporting technology platforms to alleviate geographic barriers to interventions in remote areas.

However, program effects vary considerably based on design factors. Kim et al. (2021) completed an RCT of a 10-week group Triple P parenting program across farming regions surrounding Beijing China. While the intervention improved parenting sense of competence, knowledge and skills, there were no detectable impacts on family dynamics or child development outcomes compared to controls. Researchers hypothesized that lack of individualization limited applicability for serious issues like maternal depression requiring one-on-one support.

Differences in parenting norms and literacy levels between high-income versus lower-middle income sample groups may also reduce generalizability of imported Western models. Further research should continue examining such factors to inform cultural adaptations.

In review, parental support initiatives positively impact indicators of future preschool readiness, with longitudinal gains in human capital development. Still, follow-up periods are relatively short given children's age, and few measure actual preschool enrollment as an outcome variable. While foundational language, fine motor and social-emotional skills are necessary prerequisites, further research is required from connecting interventions to increased access and persistence in quality early learning programs long-term. Integrated platforms providing complementary nutrition, cash incentives and parenting support demonstrate particular promise as multidimensional poverty alleviation strategies.

#### **4. Conclusions & Future Research Directions**

In summation, advances in poverty alleviation interventions provide encouraging evidence that rural preschool enrollment can expand through strategic investments grounded in ecological models targeting economic, health and social barriers in the home environment. Findings highlight key design principles for maximizing participation and reducing income-related school readiness gaps early in the lifecycle. Cash incentives are potent stimulants for increasing household expenditures towards early education – particularly when transfers are substantial, sustained over time, and labeled explicitly for approved child development purposes. Integrative nutrition programming fuels cumulative gains in health and stimulation while incentivizing expanded access. Parenting programs build capabilities necessary for succeeding in preschool entry. Such interventions demonstrate highest returns when embedded within multidimensional rural revitalization efforts rather than implemented in isolation.

At the same time, significant research gaps remain. Few studies examine differential impacts based on program quality or alignment to local cultural contexts. Intervention costs are rarely measured against return on investments over the long-term. Crucially, longitudinal tracking evaluating whether rural preschool participation yields lasting educational outcomes is still lacking. Additional research should focus on cost-effectiveness given substantial budget outlays required to administer and monitor conditional programming nationwide. Moving from small-scale efficacy trials towards evidence on sustainability at regional or federal levels is necessary to influence policy. Finally, further integration of findings across health, education and social welfare sectors is vital for building coherent systems of supports for the most vulnerable families across the early childhood continuum.

In conclusion, increasing preschool participation serves as a linchpin for poverty alleviation and rural community revitalization goals. Early learning propels development across physical, socio-emotional and cognitive domains while enabling parents to engage in productive work. As part of integrated place-based strategies, preschool enrollment enhances human capital critical for reversing intergenerational poverty cycles. Sustained investments that alleviate barriers to access

thus provide promising levers for economic mobility and equitable opportunity for rural regions increasingly under threat.

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# Promoting Positive Youth Development Through Family Tradition Construction in Zhejiang, China

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## Abstract

This paper explores the potential for promoting positive youth development in Zhejiang, China through the construction and passing down of family traditions. Family traditions play an important role in transmitting cultural values, fostering intergenerational relationships, and providing a sense of identity and belonging for children and adolescents. However, the impacts of modernization and urbanization have threatened traditional family practices in many parts of China. This paper argues for revitalizing family tradition construction as a pathway for positive youth development. A review of relevant literature on family traditions, positive youth development, and traditional values in China is provided to build the theoretical framework. The methodology involves qualitative interviews with 15 families in Zhejiang Province to assess their engagement in family traditions, the meaning attached to these practices, and interest in bolstering traditions. The results reveal contemporary practices, values, and tensions around traditions. Key findings show strong continuing interest in traditions for identity formation and socialization among parents, though logistical factors pose challenges. Based on the data, recommendations are provided for initiatives that schools, communities, and policymakers could take to make family tradition construction more viable for 21st century families. This includes incorporating tradition education into school curriculum, providing public spaces for traditional practices, easing activity scheduling demands, and shaping messages in media and popular culture. The paper concludes that revitalizing family traditions, with appropriate adaptations, represents a promising approach for promoting positive youth development amidst China's social changes. The research contributes valuable insights from a major eastern province undergoing rapid development and has implications for supporting youth and families nationwide through tapping into endogenous cultural resources.

## Introduction

China has experienced rapid modernization and social changes over the past few decades. While economic development and urbanization have created new opportunities, they have also disrupted traditional living patterns and values (Liu, 2020). This can be seen clearly in family structure and practices. As China continues to urbanize and integrate into global networks, there are concerns that youth are losing touch with indigenous cultural heritage and sources of identity (Hong, 2009).

At the same time, there are persistent problems of youth behavior and developmental trajectories that signal a need for new socialization approaches relevant to contemporary society.

Recent scholarship has pointed to the viability of family tradition construction as a pathway for positive youth development in China. Family traditions refer to patterned activities, rituals, and interactions that are infused with unique meaning, promoted intentionally across generations, and associated with familial identity (Fiese, 2006). These may involve practices around holidays, food culture, moral education, recreation, and ceremonies. Constructing and transmitting family traditions have been found to contribute to adolescent wellbeing and cultivation of values in diverse cultural contexts (Crespo et al., 2011). China possesses a long Confucian heritage where family tradition served as the primary means of socializing youth and maintaining intergenerational ties (Yue & Ng, 1999). Revitalizing this indigenous pathway aligned to contemporary realities may hold promise for fostering positive youth development. However, research is needed to assess the current state of family tradition construction and attitudes in rapidly changing communities.

This study aims to examine efforts by families to construct and pass down traditions in Zhejiang Province, and explore the potential of bolstering these practices as a positive youth development strategy. Zhejiang provides an important case as a developed eastern coastal province that has been at the forefront of China's modernization (Boland, 2013). Yet it retains a strong Confucian cultural identity. This paper fills a gap in understanding family tradition practices in modernized communities undergoing shifts in values and lifestyles. It utilizes qualitative methods to contemporary family tradition construction in Zhejiang, the meaning these practices hold, and ideas for enhancing initiatives. The assess goal is to inform social policies and programs that leverage indigenous cultural resources to foster positive youth development.

## **Literature Review**

Three bodies of scholarship provide the theoretical grounding for this study on family tradition construction and positive youth development in China. These encompass research on: 1) Chinese family traditions and values; 2) positive youth development; and 3) impacts of social change in China.

## **Family Traditions and Values in China**

Family traditions have served as a central mechanism for cultural transmission, moral education, and identity formation for millennia in China (Wu, 1996). Cultural values and norms were passed down intergenerationally through rituals, ceremonies, and patterned interactions. Reverence for ancestors and filial piety to parents and elders were heavily emphasized. Holidays such as Lunar New Year, Mid-Autumn Festival, and Qingming involved symbolic foods, gift-giving, and rituals that bonded families together (Ikels, 2004). These practices celebrated cultural heritage and ethnical identity. Education focused heavily on moral character development through venerating sages, reciting classics, and obeying proper codes of conduct (Li, 2005). Each generation was

responsible for carrying forward traditions that maintained social harmony.

While political and social changes have threatened traditions, their importance persists in modern China. Studies have found current practices vary based on factors like urban/rural background, class, education, and migratory status (Yue & Ng, 1999). Ethnic minorities also maintain distinct traditions. However, reverence for elders, emphasis on moral conduct, and major holidays continue to involve family rituals and gatherings. Ancestor veneration remains integral to developing a sense of identity rooted in the past (Ikels, 2004). The strong lingering influence of Confucian values can be seen in strict parental control and expectations for educational achievement (Chao & Tseng, 2002). This highlights the continuing role of tradition construction in child socialization and moral development.

### **Positive Youth Development**

Positive youth development refers to framing adolescence as a phase of cultivating strengths and purpose rather than principally risk prevention (Benson et al., 2006). This involves enabling youth to gain competencies and connections needed to navigate developmental tasks and transitions. Key competencies span cognitive, social, emotional, moral, cultural, and vocational. Connections refer to close relationships with family, peers, school, community, culture, and society that provide a sense of belonging. When youth gain these competencies and connections, they are on track for healthy outcomes (Bowers et al., 2010).

A positive youth development approach sees community institutions like schools and families as critical assets for healthy growth rather than sole problems to be fixed. Culture is valued as a developmental resource. There is focus on aligning socialization to local norms and practices rather than imposing external models (Larson & Tran, 2014). This framework aligns with using family tradition construction as an indigenous pathway for youth development in China. Enabling families to bolster meaningful rituals and interactions can potentially foster competencies and connections tied to local cultural heritage. More research is needed on this linkage in modernized Chinese communities.

### **Social Changes in China**

Urbanization, modernization, and integration into global networks have radically reshaped Chinese society since the start of reforms in 1978 (Whyte, 2010). Rural to urban migration has swelled cities. Nuclear families and empty nest elderly are increasingly common. Western values have spread, especially individualism and materialism. The one-child policy disrupted intergenerational continuities. Market competition has increased pressures on parents and youth for academic excellence. The growth of mass media and social media has exposed youth to new ideas.

These changes have disrupted traditional living patterns and values, threatening cultural transmission. Studies have observed weakening of filial piety and generational hierarchies in some contexts (Yue & Ng, 1999). However, other research notes enduring Confucian influences



and revitalization movements, especially in educational settings (Li, 2005). Hence, the impacts of modernization on Chinese family traditions remain complex. While practices have adapted, their socialization functions persist in importance, even as new issues like Internet addiction grow. This points to possible value in bolstering culturally rooted developmental pathways like family tradition construction for contemporary realities.

The existing literature establishes family tradition construction as a historically vital mechanism of socialization and positive development in China. Changes driven by modernization may be disrupting traditions but not necessarily diminishing their significance. Further research is needed to examine the state of traditions in modernized communities and potential to harness these practices for youth development versus imposing external models. This study aims to fill this gap through a qualitative study of family tradition practices and meanings in Zhejiang Province. Findings can inform social policies and initiatives to leverage indigenous cultural resources for supporting youth and families navigating China's social transformations.

### **Methodology**

This study utilized a qualitative approach to assess family tradition construction and transmission in modernized Zhejiang Province, and explore potential initiatives to bolster these practices as a pathway for positive youth development. Qualitative methods enabled collection of textured, descriptive data on family experiences, values, challenges, and recommendations related to traditions. This method aligned with the goal of gaining in-depth understanding of tradition practices amidst complex social changes in order to inform context-specific policy and programming.

### **Participants**

Participants consisted of 15 families living in urban or suburban settings in Zhejiang Province. To qualify, families had to include at least one child over age 12 along with parent(s) or grandparent(s). This enabled gathering data on experiences with family tradition socialization. Maximum variation sampling was used to recruit families diverse in structure, socioeconomic status, education level, and employment. This captured potential influences of background factors on traditions. Participants were recruited through community centers and contacts in Zhejiang. Families represented both intact and split households. Given sensitivity of discussing family matters, numbers rather than names are used to reference participants.

### **Data Collection**

In-depth semi-structured interviews were conducted with families in their homes or community centers. Open-ended questions probed participants' engagement in family traditions, the meaning and importance of these practices, challenges faced, and ideas for strengthening traditions. All members present were encouraged to contribute views. Interviews averaged 60-90 minutes and were audiotaped and transcribed. Researcher field notes supplemented the transcripts to document impressions and contextual details. Data collection continued until saturation was reached across

15 families.

### **Data Analysis**

Transcripts were coded using an iterative process to identify salient themes. Coding focused on both common and divergent experiences with traditions across the families. The goal was to elucidate rich, nuanced patterns in the meanings and practices related to family tradition construction amidst Zhejiang's modernized context. All data was secured to protect participant confidentiality. Analysis aimed to generate insights on the state of traditions, tensions faced, and initiative ideas that could inform positive youth development policies and programs tailored to contemporary Chinese communities.

### **Results**

The qualitative interviews yielded multifaceted data on family tradition practices, values, challenges, and recommendations among Zhejiang participants. Key themes centered engagement in intergenerational activities to transmit moral values and cultural identity. These practices were seen as vital for positive youth development amidst disruptive social changes. However, families faced logistical difficulties sustaining meaningful tradition construction. Participants suggested ideas for community initiatives that could bolster intergenerational interactions and learnings around traditions adapted for modern lifestyles. Detailed findings are presented below.

### **Ongoing Cultural Traditions and Rituals**

All families reported engaging in at least some meaningful cultural traditions and rituals rooted in Zhejiang and broader Chinese heritage. These focused on major holidays, moral education, and family occasions. For holidays, common practices involved Lunar New Year rituals, ancestral veneration during Qingming, moon worship at Mid-Autumn Festival, and Dragon Boat Festival dumplings. As one mother described, "Holiday traditions unite us together, remind us of our common roots" (Family 7). Other families emphasized moral education through reciting Confucian classics, discussing ethics through stories of exemplary figures, and modeling filial piety and diligence. Rituals like ancestral veneration, weddings, and coming-of-age ceremonies were highlighted for cultural meaning.

### **Persisting Value of Traditions**

Families emphasized that transmitting traditions remained highly important despite modern lifestyles. Reasons involved maintaining cultural identity, fostering morality, and strengthening intergenerational bonds. As one father explained, "Traditions teach the essence of being Chinese – respect for family, importance of education, hard work" (Family 2). An elderly grandmother stated, "Children today face many temptations from Internet and society. Traditions guide them morally, spiritually" (Family 5). Parents and youth alike valued traditions for facilitating intergenerational connection. One adolescent said sharing traditions meant, "I understand my parents and where I come from" (Family 9). These views showed family rituals continue to serve

vital socialization functions even amidst contemporary issues youth face.

### **Tensions in Sustaining Traditions**

While affirming the importance of traditions, families also acknowledged facing difficulties sustaining meaningful practices. Some challenges were logistical, like parents working long or inflexible hours that prevented holiday gatherings. Several parents described lacking sufficient knowledge of cultural customs from their own upbringing to pass down. Other tensions were intergenerational – some youth resented being forced to take part or saw traditions as irrelevant. As one teenager said, “I want to focus on my future, not just the past” (Family 11). Some parents admitted prioritizing other extracurricular or academic activities over tradition practices. Geographic mobility also disrupted extended family rituals. However, overall families expressed desire to maintain relevant cultural traditions through flexible, creative adaptations.

### **Discussion**

This study provided qualitative insights on the state of family tradition practices amidst social changes in Zhejiang Province, and ideas for strengthening these traditions as a pathway for positive youth development. Key findings showed families maintain engagement in meaningful cultural rituals and moral education activities, underscoring their perceived importance for identity, values, and cohesion. However, growing tensions make sustaining high-quality intergenerational tradition participation difficult. Participants proposed community-level initiatives to foster accessible, engaging spaces for tradition construction.

The results align with previous research on the impacts of modernization on Chinese family traditions. Practices have been adapted and simplified in many cases, creating intergenerational differences in meaning attached to rituals (Yue & Ng, 1999). Geographic mobility and intensive school demands disrupt gatherings. However, core socialization functions remain salient. Findings demonstrate strong continuing desire for transmitting moral values and cultural identity through family traditions. This points to latent strengths in indigenous practices that could be leveraged for positive youth development.

The study contributes much-needed data from Zhejiang Province, which represents a vanguard of China’s economic and social changes. Families in this region navigate tensions between modernization and maintaining heritage. Findings provide evidence that family traditions retain developmental significance even in highly modernized communities. Results illuminate accessible ways policy and programming can support families to bolster traditions aligned with contemporary lifestyles. Suggestions like integrating tradition education into schools, making public spaces available, and using media advocacy have viability for nationwide scaling. Efforts are needed to bolster cultural developmental assets while addressing problems like academic pressure.

Limitations of this study include the small qualitative sample. Further quantitative research could provide generalizable data on traditions and developmental outcomes with larger samples.

Longitudinal data could shed light on intergenerational changes. Comparative data from less modernized regions would illuminate differences. Future studies could also assess impacts of specific initiatives like school-based tradition education on youth competencies. Overall, the study makes an important contribution in pointing to potent cultural resources for positive development in rapidly changing communities.

## Conclusion

This study utilized in-depth interviews to elucidate the state of family tradition practices in modern Zhejiang Province, China. Findings reveal families maintain engagement in meaningful cultural rituals and moral education activities. However, growing tensions pose challenges to sustaining high-quality intergenerational tradition participation amidst social changes. Participants proposed ideas for community initiatives to bolster accessible, engaging spaces for tradition construction aligned with contemporary lifestyles. Results illuminate the persisting developmental role of family traditions even in highly modernized Chinese communities. Findings can inform social policies and programs aimed at leveraging indigenous cultural resources to promote positive youth development. With appropriate adaptation, family tradition construction represents a promising strength-based approach to supporting Chinese families and youth navigating social transformations.

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# A Conceptual Paper: The Impact of Agility Training for Institution of Higher Learning Students on Performance Enhancement in Basketball Players

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## Abstract

Basketball is a fast-paced sport requiring agility to react and change direction rapidly on the court. Agility training focuses on improving coordination, speed, and reaction time through drills that mimic common basketball movements. This paper examines the importance of agility in basketball and evidence that agility training enhances components of basketball performance. Agility differentiates skill level and relates to greater playing time. Methods to improve agility including ladder drills, cone drills, agility discs, and plyometrics are outlined. Multiple studies demonstrate agility programs can significantly improve linear and change-of-direction speed, vertical jump height, and overall skill execution. Recommendations are provided for incorporating agility training into basketball practices targeting sport-specific movement patterns. With proper program design and periodization, agility training boosts maneuverability, explosiveness and quickness vital for basketball success.

**Keywords:** basketball, agility, performance, drills, plyometrics, speed

## 1. Introduction

Basketball is a fast-paced sport that requires players to be agile and quick on their feet. Agility is defined as the ability to change direction rapidly while maintaining control and balance (Sheppard & Young, 2006). This includes skills such as dodging, weaving, and changing pace. Agility training focuses on improving these movement skills through drills and exercises that challenge coordination, speed, and reaction time. For basketball players, increased agility translates to improved performance on the court. More agile players are better able to drive past defenders, explode to the basket, move without the ball, and defend one-on-one. As the game of basketball continues to evolve and athleticism becomes increasingly important, agility training is emerging as a key component of performance enhancement.

This paper will provide an overview of the impact of agility training on basketball players. First, it will discuss the role of agility in basketball and why it is an important athletic attribute for success. Next, it will outline different methods and exercises for improving agility, including ladder drills, cone drills, agility discs, and plyometrics. The paper will then examine studies on

the effects of agility training interventions on components of basketball performance such as speed, change of direction, vertical jump, and overall skill. Finally, recommendations will be provided for how basketball coaches and strength professionals can incorporate agility work into training programs to see optimal improvements in on-court performance.

## **2. The Importance of Agility in Basketball**

Agility is considered one of the key athletic components in basketball along with speed, quickness, strength, and leaping ability (Delextrat & Cohen, 2009). The sport involves constant change of direction, starting and stopping, and reactive movements. Offensively, agility helps players maneuver to open spaces for scoring opportunities. It enables quick cuts to the basket, sharp pivots or spins to evade defenders, and fast drives to the rim. Defensively, agility allows players to mirror opponent's movements, rapidly close-out on shooters, and shuffle feet staying in front of dribble penetrations. Overall, agility influences a player's ability to accelerate, decelerate, and alter direction efficiently on the court (Spiteri, Cochrane, Hart, Haff, & Nimphius, 2013).

An analysis of game demands shows basketball players change activity on average every 2 seconds and perform a significant number of high-intensity sprints, shuffles, jumps and rapid side-cutting movements in a game (McInnes, Carlson, Jones, & McKenna, 1995). This unpredictable, intermittent style of play requires a high level of agility for players to react and explode in any direction. A study comparing basketball players across different levels of competition found that professional and collegiate players performed significantly better on agility tests than recreational players (Delextrat & Cohen, 2009). The elite players demonstrated quicker reaction time, faster change of direction speed, and ability to maintain control during complex agility drills. This indicates agility separates the high performers in basketball.

Research also shows that agility differentiates between starters and nonstarters on basketball teams. In a study of college basketball players, starters completed an agility “pro-agility” test in 4.77s on average versus 5.03s for nonstarters (Hoffman, Tenenbaum, Maresh, & Kraemer, 1996). The agility test measured players' ability to sprint forward, side shuffle, back pedal, and sprint again at maximal effort. Similarly, in high school basketball athletes, starters performed agility t-tests faster than nonstarters across all age groups (Hoare, 2000). Together, these findings demonstrate that higher agility relates to greater on-court playing time and performance. While natural ability plays a role, purposeful training is necessary to fully maximize a player's agility.

## **3. Methods for Improving Agility**

There are several evidence-based training methods basketball players can use to boost their agility and explosiveness on the court. These include ladder drills, cone drills, agility discs, and plyometric exercises. Coaches and trainers can incorporate these tools into dynamic warmups or agility-focused stations during practices.

Ladder drills involve performing various footwork patterns while moving up, down, and laterally along a ladder placed flat on the ground. Common patterns include one foot in each box, both feet in each box, hopscotch, in-outs, and lateral shuffles (Behringer, 2011). The drills challenge coordination, balance, and quickness of foot movements. Cone drills require players to run preset patterns around cones set up on the court. These can involve forward and backward sprints, shuffling, changes of direction, and carioca runs facing sideways (Pritchard, 2012). Variations in cone placement allow customization of agility patterns.

Agility discs or buttons are round plastic discs that can slide across a gym floor. Players perform rapid multi-directional steps and shuffles to move the discs from point to point as quickly as possible (Behringer, 2011). This unpredictable and sport-specific exercise improves reaction time for changing direction. Plyometric or jump training helps develop reactive power in the legs. Bounding, hopping, and box drills that involve rapid switching from eccentric to concentric contractions challenge explosiveness (Asadi, 2013). Short 30-60 second bouts with full recovery are recommended.

Incorporating new agility drills with ladder, cone, disc, and plyometric variations regularly introduces new movement patterns and prevents accommodation from repetitive training. This can help continually develop agility skills over time. Coaches should focus on proper movement mechanics during new drills and then increase difficulty and speed with progression. High-intensity agility efforts should be followed by longer recovery periods for full neuromuscular regeneration between bouts. With careful programming, these agility training tools can elicit adaptations that transfer directly to improved maneuverability and quickness during basketball competition.

#### **4. Effects of Agility Training on Basketball Performance**

A growing body of research has investigated the effects of targeted agility programs on components of basketball performance. Multiple studies have found improvements in speed, change of direction ability, vertical jump, and overall skill level following 4-12 weeks of agility training in basketball players.

In college male basketball players, a 10-week program of ladder, cone, and plyometric agility drills performed twice per week significantly improved 36.58m sprint time by 2.14% and pro-agility test time by 4.16% compared to control (Asadi, 2013). The lateral agility drills mimicked common footwork patterns used on court. Similarly, high school female basketball players reduced 36.58m sprint time by 1.6% and 9.1m x 18.3m shuttle run time by 3.3% after 8 weeks of in-season agility training (Shaji & Isha, 2009). Agility drills were performed for 10-15 minutes during 3 practices each week.

Beyond linear and change of direction speed, agility training enhances explosive vertical leap. After 6 weeks of ladder footwork and plyometric training, college female basketball players increased vertical jump height by 12.7% on average (Arazi & Asadi, 2011). Jump height is a key attribute for success in basketball rebounding and defense. Agility programs likewise benefit

youth players. Following a 6-week program of cone agility drills and jumping routines, vertical jump in youth male players improved by 2.38 inches compared to controls (Yapicioglu, Colakoglu, Gulluoglu, Colakoglu, & Beydemir, 2019). These findings demonstrate that agility training provides an effective way to develop lower body power for basketball.

While speed and jump gains are beneficial, agility drills also improve overall basketball skills. After 8 weeks of agility training combining ladder drills, shuffling patterns, and quick cuts, significant improvements were found in the basketball skills of passing (8.4%), dribbling (12.1%), shooting (9.7%), and defense (15.7%) in youth players (Shaji & Isha, 2009). These open skills better simulate game demands compared to straight line sprinting. Similarly, high school players who completed 6 weeks of on-court agility training showed greater enhancements in speed, agility, and basketball-specific skills during live scrimmages compared to generic training (Taylor, Wright, Dischiavi, Townsend, & Marmon, 2017). Dynamic agility drills that mimic basketball footwork produce better skill transfer than general conditioning.

Based on the current evidence, agility training through ladder, cone, plyometric, and sport-specific drills, improves speed, change of direction ability, vertical jump height, and overall skill execution in basketball players. Gains are shown in as little as 6 weeks when programs incorporate agility training 2-3 times per week for 10-20 minutes per session. Coaches can integrate agility work during warm-ups or within speed and conditioning periods a few times per week. Just as basketball players require skill practice, they also benefit from consistent overload and progression in agility challenges. A multidimensional approach to agility training enables well-rounded improvements in basketball performance.

## **5. Recommendations for Agility Training Implementation**

Agility is a vital athletic skill for success in many sports that involve quick changes of direction and fast reaction movements. Agility enables players to accelerate, decelerate, and alter direction efficiently while maintaining control and balance. Sports like basketball, soccer, football, field hockey, rugby, tennis, and volleyball all require agility to react and maneuver on the field or court. Developing agility follows the training principle of specificity – agility must be trained through agility-focused drills and exercises. Linear sprinting and standard weight training alone are not enough to maximize agility potential. This paper provides comprehensive recommendations for strategically designing and implementing agility training programs based on current research and practices. The guidance will cover integrating agility into warm-ups, creating sport-specific drills, structuring workouts, programming variables, and proper coaching instruction. With an evidence-based approach, agility training can elicit adaptations that directly transfer to enhanced performance during competition.

A dynamic warm-up that activates the neuromuscular system is an ideal time to incorporate preparatory agility drills. Warming up with purposeful agility movements helps prime the body for more intense training to follow. The aim is controlled rehearsal of specific movement patterns at a low to moderate intensity. For example, basketball players can go through ladder footwork, zig zag shuffling, and lateral slides to ready the ankles, knees, and hips for multi-directional



motion (Sohnlein, 2014). Soccer players may benefit from progressive accelerations into top speed runs followed by deceleration stops and quick changes of direction. The goal is raising core temperature, increasing range of motion, enhancing coordination, and rehearsing agility mechanics (McMillian, 2006). A general warm-up of 5-10 minutes of light jogging, dynamic stretching, and activation exercises should precede agility movements.

Coaches should choose simple agility drills during warm-up that align with the sport's specific demands. Hurdle walks, side shuffles, cariocas, backpedaling, and skipping drills get muscles firing for start-stop motions. Cone drills with 5-10 yard sprints and cuts help potentiate acceleration into top speed. Sequencing 2-3 agility drills with 1-2 sets primes the body for more dynamic training. Maintaining good posture and body control is vital even during warm-up. Rushed, sloppy movements ingrain poor mechanics that transfer into competition. Allow a gradual buildup into the highest intensity movements. A dynamic agility-focused warm-up enhances readiness for subsequent high-speed training.

The principle of specificity means agility drills should recreate common movements and footwork required in the sport to maximize transference. Straight ahead linear sprints do not carryover as effectively as patterns with cuts and pivots. Coaches must design drills that mimic the specific agility skills needed most for the sport. For basketball, drills emphasizing lateral shuffling, backpedaling, and rapid changes of direction simulate defending an offensive player (Spiteri, 2013). Soccer agility drills include sharp turns, lateral movements, and reacting quickly in confined spaces to reflect maneuvers around opponents. For field hockey, drills that challenge side-to-side footwork and dodging mimic skirting defenders. Sport-specific drills also integrate the use of equipment like sticks, rackets, or bats and the cognitive demands of reacting to moving objects.

Beyond footwork, sport-specific drills factor in the energy demands and work intervals of that sport. For example, football agility often emphasizes the ability to perform repeated high-intensity 40 yard sprints with minimal recovery to mimic the stop-and-go demands. Tennis agility drills focus on repeated short 5-10 yard bursts to simulate rapid adjustments at the net. Interval training that reflects common game durations enables the right energy system adaptations. Recreating sport environments like reacting to coaches' cues, dodging objects, or chasing moving balls enhances agility under pressure. The more drill design simulates the specific movement patterns, cues, fatigue, and objectives of that sport, the greater the performance transfer.

Proper program design is crucial for agility training effectiveness. Workouts should follow a progressive sequence that considers athlete readiness, appropriate warm-up, high intensity work intervals, active rest, and cool down. Athletes should arrive hydrated and fueled for best results. The warmup as described previously primes the body and prevents injury risk (Jeffreys, 2006). The main agility workout follows the warmup and focuses on maximizing work intervals for a training effect while allowing adequate recovery between bouts.

For most team sports, work intervals in the range of 10-30 seconds are ideal for high intensity agility efforts. This taxes the ATP-CP anaerobic system responsible for explosive power

(Sheppard, 2006). Commonly, agility sessions employ work-to-rest ratios ranging from 1:3 to 1:5. For example, 15 seconds of high intensity shuffling followed by 60-90 seconds of lower intensity jogging for active recovery. Multiple sets of 10-30 second work bouts with full recovery comprise the main session with 3-4 minutes rest between sets. A general structure is 2-4 sets of 4-8 work intervals at the desired intensity. Total session volume ranges from 10-20 minutes excluding warmup and cool-down.

The cool-down helps bring the body back to homeostasis after intense exertion. This involves 5-10 minutes of light jogging or shuffling to actively recover by clearing metabolic by-products and avoiding pooling of blood in the lower extremities. Stretching, rolling, and hydration after training are also beneficial. Proper structure ensures agility sessions progressively ramp up intensity through work intervals and recover fully between sets to allow maximal speed and effort. Workload, volume and intensity can increase over subsequent sessions.

There are several key programming variables to consider for optimal agility development including volume, intensity, rest intervals, pattern complexity, surface/footwear, and proper periodization. Volume is the total amount of high intensity agility work. For beginners, a volume of 50-120 foot contacts or 100-200 yards is recommended in a session divided into multiple sets (Young, 2006). Intermediate and advanced athletes can progress to 150-250 contacts or 300-500 yards per session. Excessive volume leads to diminishing speed, indicating the need for rest.

Intensity corresponds to the speed and effort level of agility work intervals. Training requires all-out maximal bursts, not pacing. Intensity and volume share an inverse relationship - higher intensity allows for lower volume and vice versa. Rest interval length also impacts intensity. Allowing at least 1:5 work to rest ratio enables full ATP-CP recovery for maximal bursts each repetition (Bloomfield, 2007). Too little rest lowers peak intensity.

As athletes adapt, new patterns and surfaces add complexity. Ladder drills, hurdles, tennis balls, slope changes are examples. A systematic progression from simple to more complex, reactive drills enhances agility. The correct footwear is critical for acceleration traction and sudden braking during cuts. Agility programs must periodize volume, intensity, and complexity with peaks and recovery built in over weeks and months (Sheppard, 2012). Careful manipulation of key variables optimizes the training response over time.

Quality coaching is essential to reinforce proper agility technique and intensity. Coaches should emphasize posture, body control, and mechanics when first learning new drills. Cues like “stay low through the hips” and “plant the outside foot to change direction” refine movement. Draw attention to key muscle actions during specific drills to enhance motor unit recruitment and coordination. Providing targets and reactive cues add realism to drills.

Once athletes demonstrate mastery, coaching focus shifts to speed and effort. Cues such as “explode out of the cut” and “maximal speed to the line” prompt all-out intensity. Referencing competition helps motivate maximal exertion. Coaches must also insist on full recovery between repetitions for consistency. Finally, positive reinforcement when athletes demonstrate proper

progressions keep confidence high. Constructive corrections and variations maintain challenge. Effective agility coaching maximizes skill learning, intensity, and enjoyment.

When designing agility programs, integrate sport-specific warm-up drills to prime the body and activate muscles for the patterns to come. Structure sessions with appropriate work-to-rest ratios and progressions. Emphasize quality movement techniques before speed. Manipulate programming variables like volume, intensity, complexity and recovery over time. Cue intensity and provide positive, specific feedback. With evidence-based implementation, agility training reaps significant performance benefits across many sports through enhanced maneuverability, reaction time, explosiveness, and control.

Basketball players exemplify the need for well-developed agility. Quick cuts, sudden starts and stops, and lateral defensive slides are all common movements in basketball. This section provides sample recommendations for structuring an 8-week summer agility program for high school basketball players using the evidence-based guidelines introduced previously. The summer preseason enables focus on foundational athletic development before the demands of competitive in-season play.

Agility training is taxing and should be implemented systematically alongside basketball skill practice. A polarized program that balances high intensity days with lower intensity recovery days allows for tissue regeneration between sessions. With evidence-based programming and periodization, agility training provides a key supplemental component to enhance performance and reduces injury risk in aspiring basketball players.

## **6. Conclusion**

Agility plays a pivotal role in basketball as players constantly react, accelerate and change direction on the court. Research demonstrates that integrating ladder, cone, plyometric, and sport-specific agility drills improves speed, agility, vertical leap and overall skill execution. Proper programming variables such as brief, high-intensity bouts, complexity progression, and long rest intervals maximize training transfer. Basketball coaches can seamlessly incorporate agility stations during warm-ups or practices several days per week. With continued overload and variation in agility challenges, players can develop this vital athletic quality over time. A well-structured agility training program is a valuable investment for basketball players striving to take their performance to the next level through enhanced maneuverability, explosiveness, and reactive quickness during competition.

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# A Comprehensive Analysis of User Behaviour and Performance on the Google Merch Shop Website

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## Abstract

The study provides a comprehensive analysis of the Google Merch Shop website's user behaviour and performance over a three-month period, from December 2022 to February 2023. By examining data extracted from Google Analytics, the report explores various aspects of the website, including its audience, user acquisition, and user engagement. Key findings include the website's strong presence in the United States, a predominantly male user base, and insights into user interests and behaviours. These findings are valuable for optimising marketing strategies, enhancing user experience, and driving business growth.

**Keywords:** Google Analytics, website performance, audience analysis, user acquisition, user engagement

## 1. Introduction

### *1.1 Definition of Google Analytics*

Google Analytics is a free web analytics service that offers basic analytical tools and statistics used for search engine optimisation (SEO) and marketing. It is a powerful tool for website owners and marketers looking to optimise their websites and improve their online presence. Google Analytics can be accessed through the Google Analytics website or a mobile app, and there are also a variety of third-party tools and plugins available to help users get the most out of the service (Analytics, n.d., Google Analytics Academy, n.d.).

### *1.2 Functioning of Google Analytics*

Google Analytics collects data through short lines of Javascript or HTML code called tags, which are placed on a web page and collect data points when triggered by a specific event, such as when a visitor views a page, clicks on a link, or plays an embedded video. It tracks various hits (or data points), including pageviews, events, and transactions, and collects a wide range of metrics, including user demographics, session statistics, approximate geolocation, and browser and device information.

### *1.3 Processing and Reporting*

Google Analytics uses measurement code to collect and transmit data for processing into reports. It generates three primary reports: the audience report, the acquisition report, and the behaviour report.

The audience report provides a detailed profile of website visitors, encompassing demographics, interests, location, user behaviour classification, and device usage. Its goal is to identify target markets and improve marketing strategies (Bishop, 2018).

The acquisition report evaluates various marketing channels' performance, including organic and paid search, direct access, referral traffic, and display advertising. This aids in resource allocation and strategy optimisation (Zaric, 2023).

The behaviour report assesses website performance by analysing page views, time spent on pages, bounce rates, and exit rates (Roy, 2021). This information assists in enhancing content and strategies for improved engagement and conversions (Global, 2020).

## **2. Google Merch Shop**

Google Merch Shop (<https://shop.googlemerchandisestore.com/>) is an online store that sells a wide range of official Google merchandise for customers in the United States, Canada, and globally. The store offers apparel, drinkware, fun and games, accessories, and home and office items, all bearing Google, YouTube, and Android logos.

In an increasingly digital world, online shopping has become a prominent activity for consumers. Understanding user demographics, interests, and behaviour is essential for e-commerce websites (Global, 2020). The behaviour of users, such as the pages they visit, the time they spend on the site, and their interactions, can provide valuable insights into how to enhance the user experience (Roy, 2021).

The analysis for this study was carried out by extracting data from Google Analytics, focusing on the performance of the Google Merch Shop website during the period, December 1, 2022, to February 28, 2023.

## **3. Results**

### *3.1 Audience Report*



Figure 1. Users by Country

Figure 1 shows that the United States boasts the highest number of users, followed by Canada, showcasing a strong following in North America, evident by dedicated sections for the US and Canada.

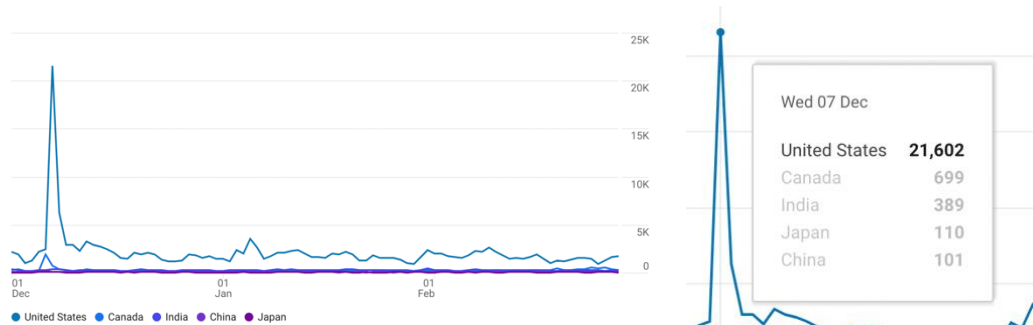


Figure 2. Users by Country over Time

From Figure 2, on December 7, 2022, the Google Merch Shop website saw a notable surge in traffic. This increase could be attributed to effective marketing campaigns or promotions aimed at the U.S. audience, such as holiday sales for Christmas.

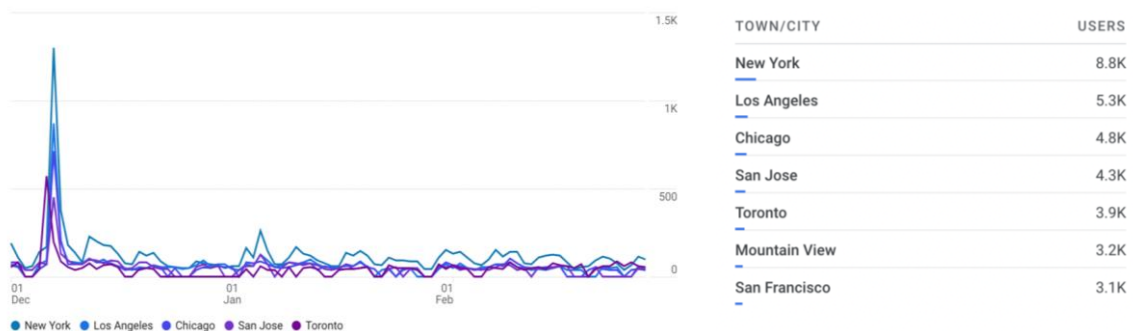


Figure 3. Users by Town/City

The data on Figure 3 reveals that New York has 8,800 website users, followed by Los Angeles with 5,300 and Chicago with 4,800 users. This suggests a substantial urban presence for the

website ("How E-commerce Is Reaching Beyond Urban Areas", 2017).

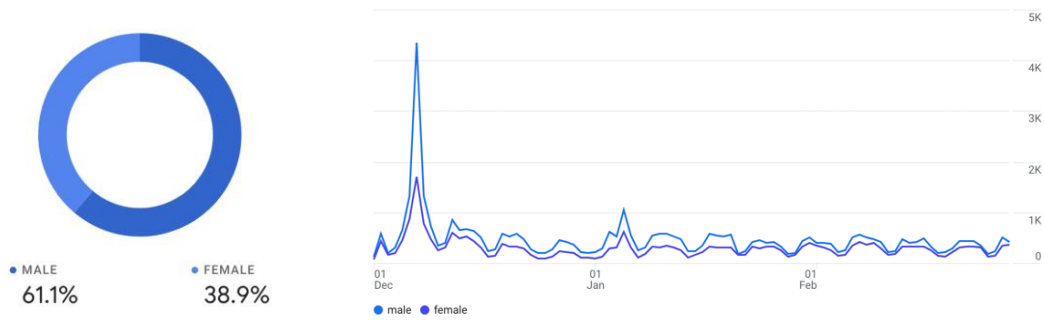


Figure 4. Users by Gender

From the data in Figure 4, male users comprise 61.1% of the total audience, while females account for 38.9%. There is a stronger appeal to male users, possibly due to targeted promotions aligned with their interests, as men's interest in shopping is increasing (Petro, 2019). Established brand names known for consistent quality tend to foster customer loyalty (Kokemulle, 2019).

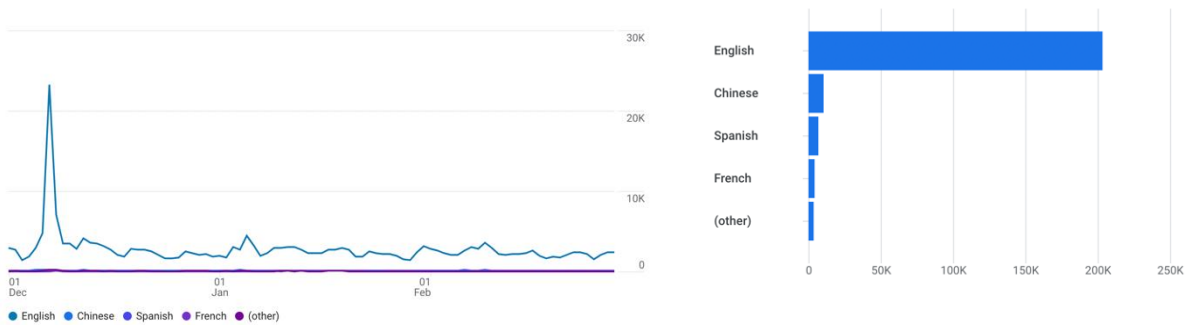


Figure 5. Users by Language

Figure 5 shows the prevalence of English as the preferred language, which highlights the Google Merch Shop website's global appeal, suggesting accessibility to both native English speakers and non-native users comfortable with the language.

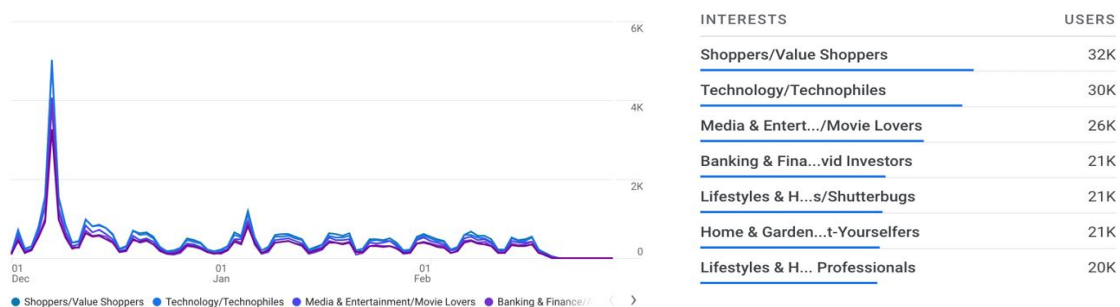


Figure 6. Users by Interests



In Figure 6, the high number in the "shoppers/value shoppers" group suggests an attraction to discounts and deals. Online stores often provide competitive pricing and discounts, which can influence purchase decisions (Lee & Chen-Yu, 2018).

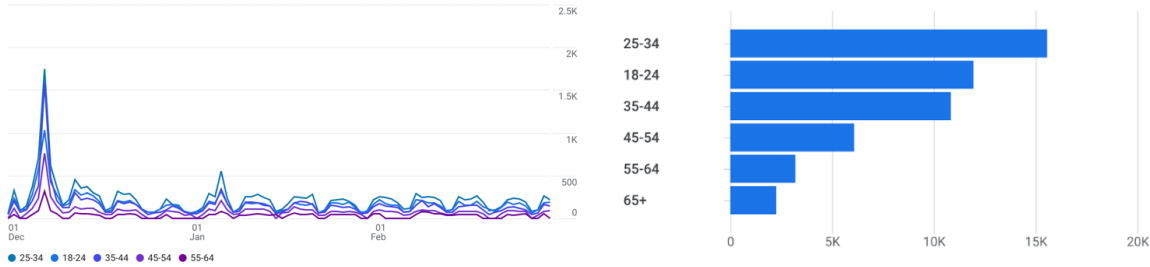


Figure 7. Users by Age

Figure 7 shows the primary audience of the Google Merch Shop falls within the 25-34 age group, highly engaged with the site's content and products (C. McDonald, 2018). The 18-24 age group follows, signifying successful engagement with college students, young professionals, and early-career individuals, particularly active on social media (wearesocial.net, 2023).

### 3.2 Acquisition Report

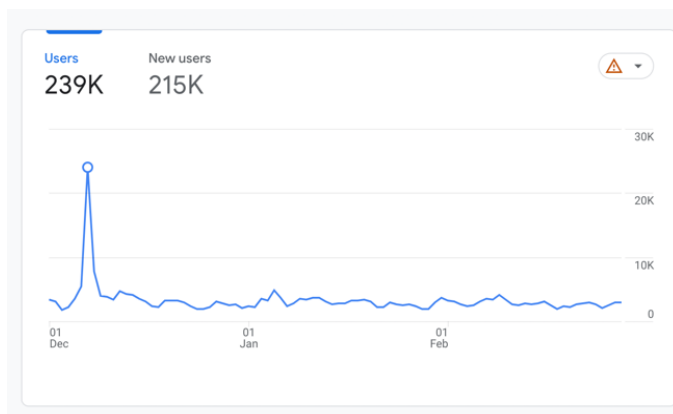
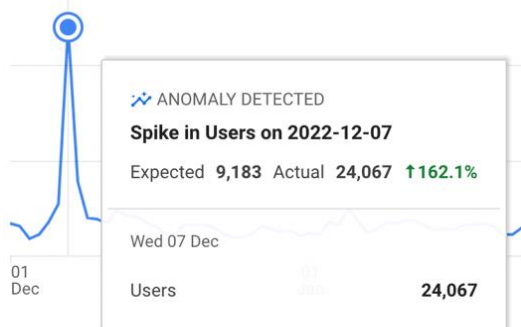


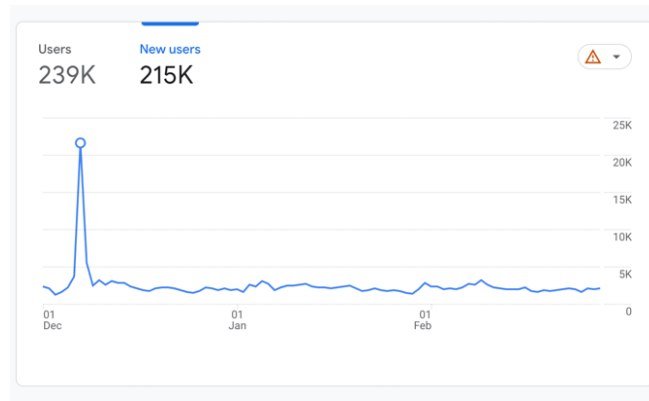
Figure 8. Acquisition Overview with Users

Figure 8 presents the total user count of 239,000, reflecting significant traffic to the Google Merch Shop website over the specified period, showing its substantial audience.



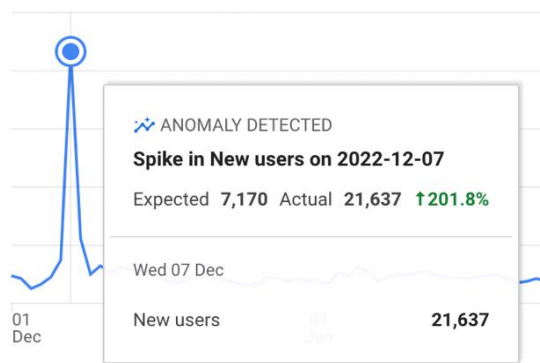
*Figure 9. Anomaly Detected a Spike in Users*

Data in Figure 9 shows an increase of 24,067 users on December 7, 2022, which suggests an anomaly, possibly due to marketing campaigns, promotions, or holiday sales for Christmas attracting a significant number of users on that specific day.



*Figure 10. Acquisition Overview with New Users*

In Figure 10, the addition of 215,000 new users points to consistent growth and an expanding user base, possibly reflecting successful marketing strategies that have attracted a significant number of first-time visitors.



*Figure 11. Anomaly detected spike in new users*

A surge of 21,637 new users visited the Google Merch Shop website on December 7, 2022, as shown in Figure 11, significantly deviating from the usual pattern. This change might be related to marketing campaigns, promotions, or holiday sales for Christmas, influencing user behaviour and preferences.

FIRST USER DEFAU...	NEW USERS
Direct	96K
Organic Search	58K
Paid Search	23K
Display	15K
Cross-network	13K
Organic Video	2.5K
Referral	2.4K

Figure 12. First User Default Channel Group

Figure 12 shows the top user acquisition channel for the Google Merch Shop website is "Direct," with 96,000 users. This indicates strong brand recognition and user loyalty. "Organic Search" follows with 58,000 users, showcasing effective SEO strategies to attract potential customers (Wise, 2023).

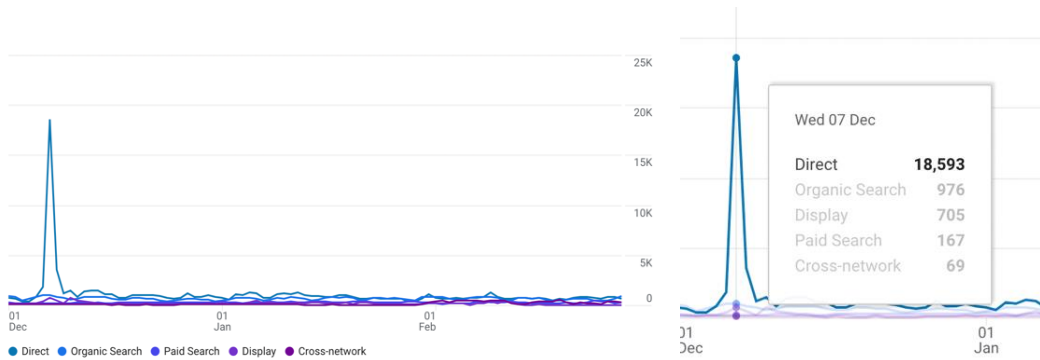


Figure 13. First User Default Channel Group Over Time

In Figure 13, on December 7, 2022, there was a considerable surge in direct traffic, with 18,593 users visiting the Google Merch Shop website. This spike is an anomaly and might be related to marketing campaigns, promotions, or holiday sales for Christmas on that particular date.

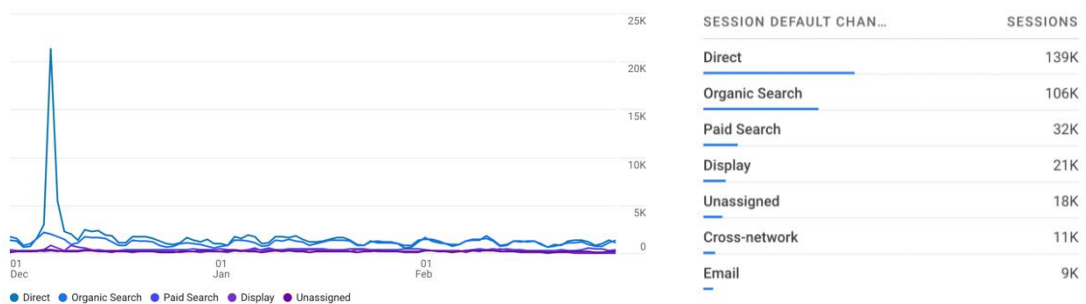


Figure 14. Session Default Channel Group

Data in Figure 14 shows "Direct" leads with 139,000 sessions, indicating users directly accessing the Google Merch Shop website. "Organic Search" comes in second with 106,000 sessions, suggesting that people find the website by using search engine optimisation tactics that work.

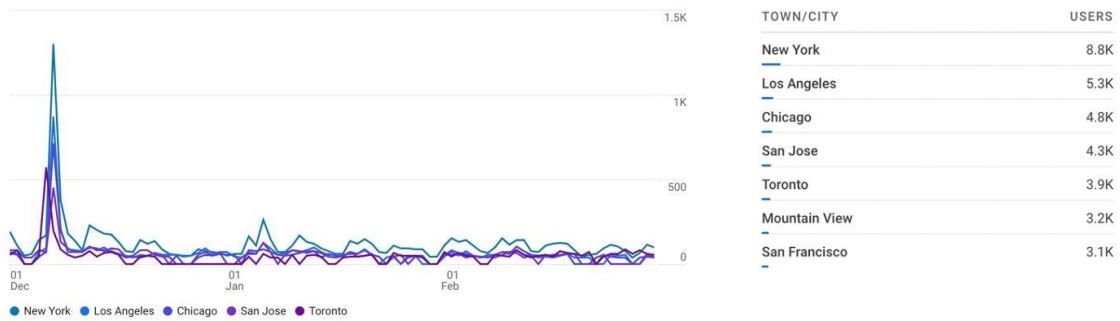


Figure 15. Users by Town/City

The data presented in Figure 15 indicates that e-commerce and online shopping are becoming more and more popular in these urban areas. New York leads the pack with 8,800 users, followed by Los Angeles with 5,300 users.

### 3.3 Behaviour Report

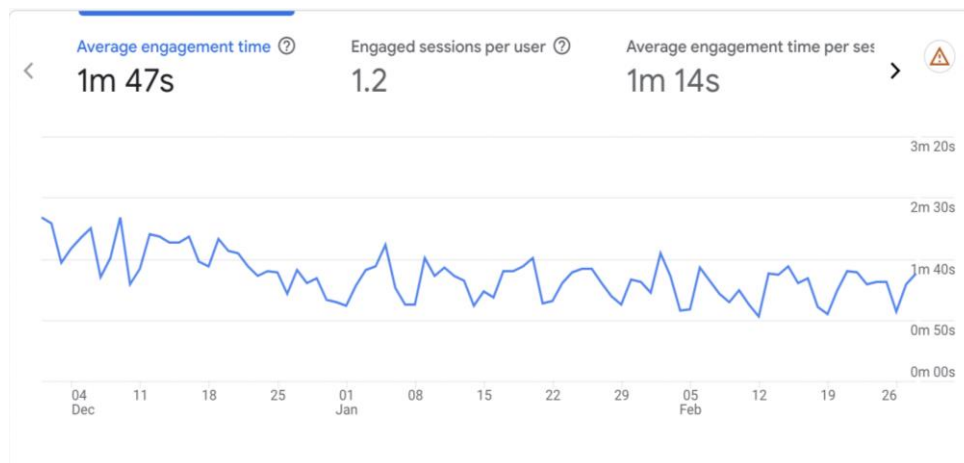


Figure 16. Average Engagement Time

Figure 16 shows that users are interested and engaged on the Google Merch Shop website, with an average engagement time of one minute and 47 seconds per session. This duration suggests users find the content relevant, explore multiple pages, read product descriptions, and engage with other content (Skow, 2023).

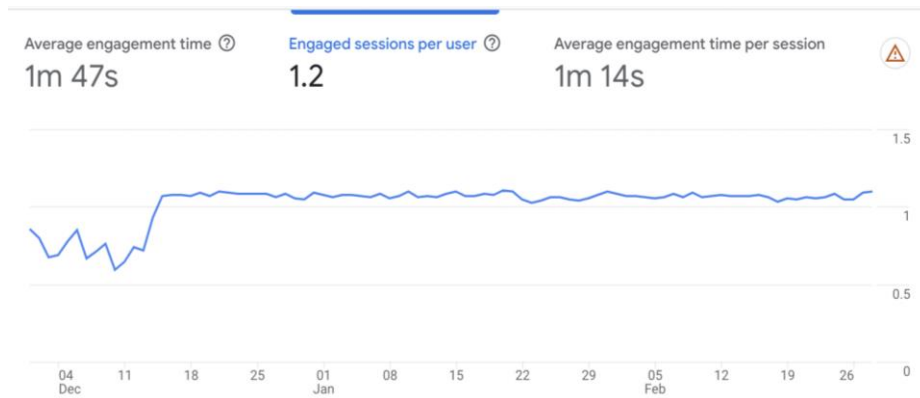


Figure 17. Engaged Sessions per User

In Figure 17, each user has 1.2 engaged sessions per visit to the Google Merch Shop website averagely, indicating successful user retention and encouraging repeat interactions.

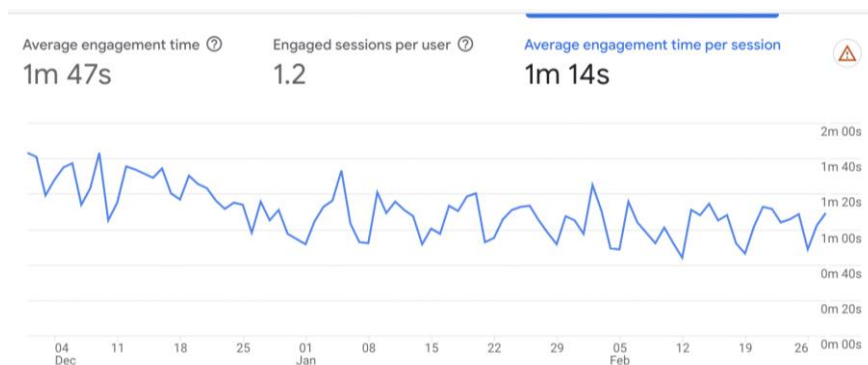


Figure 18. Average Engagement Time Per Session

Figure 18 shows that the average time users actively interact with the Google Merch Shop website during each visit is 1 minute and 14 seconds. It shows that users are using the website's features and content for a brief period of time and that their browsing behaviour is relatively quick.

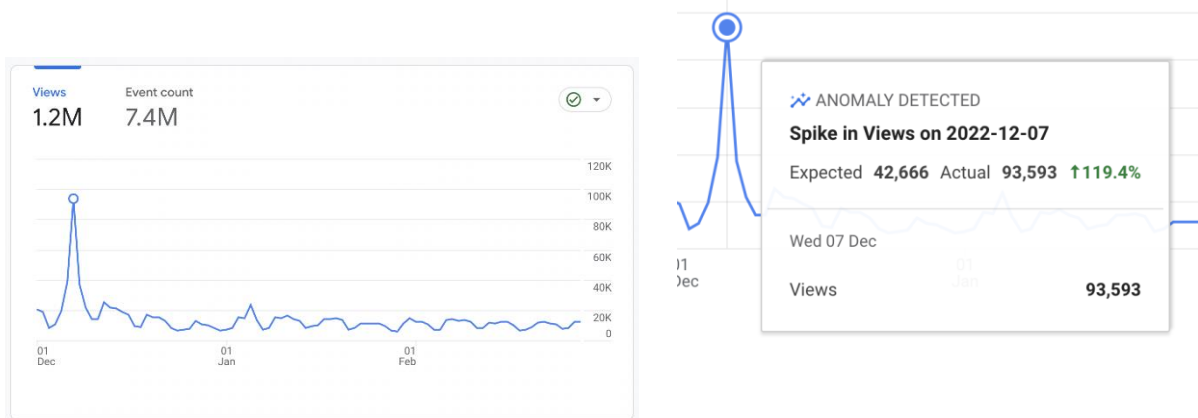


Figure 19. Average Views

The data in Figure 19 shows that the daily average of 1.2 million views indicates consistent and sustained traffic on the Google Merch Shop website. However, a notable spike on December 7, 2022, with 93,593 views, stands out as an anomaly. It might be linked to marketing campaigns, promotions, or holiday sales for Christmas, drawing increased user activity on that specific date.

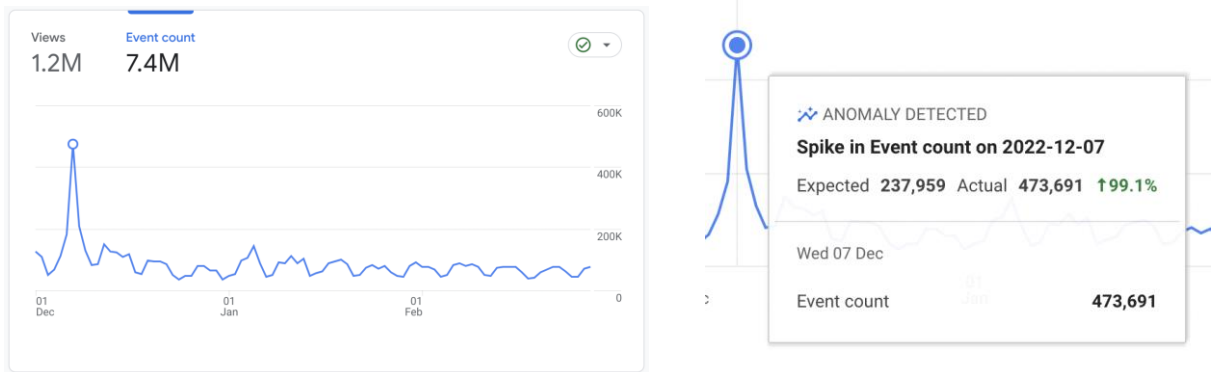


Figure 20. Average Engagement Time

Throughout the analysed period, the website recorded 7.4 million user interactions. On December 7, 2022, a notable spike of 473,691 events stood out as an anomaly compared to the daily average, as shown in Figure 20. This could be due to marketing campaigns, promotions, or holiday sales for Christmas.

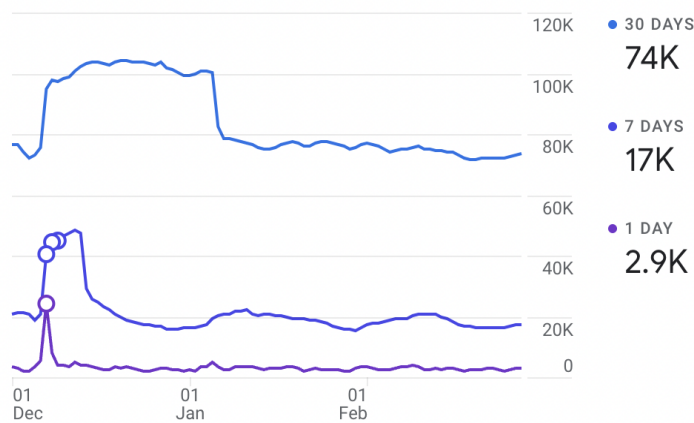


Figure 21. User Activity

The data in Figure 21 provides user activity data over three timeframes: 30 days, 7 days, and 1 day. It helps assess long-term, weekly, and daily user engagement, offering insights into the website's appeal and the impact of short-term events or promotions.

EVENT NAME	EVENT COUNT
<a href="#">view_promotion</a>	2M
<a href="#">page_view</a>	1.2M
<a href="#">view_item_list</a>	1.2M
<a href="#">user_engagement</a>	979K
<a href="#">scroll</a>	517K
<a href="#">session_start</a>	339K
<a href="#">view_item</a>	272K

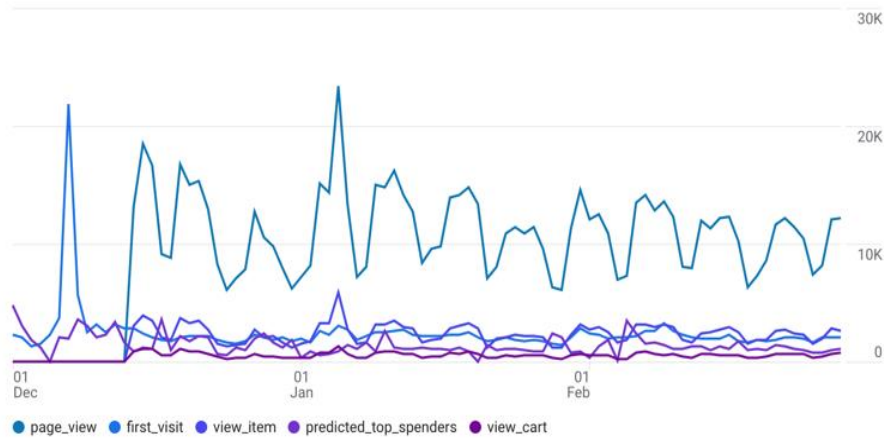
Figure 22. Event Count by Event Name

The data in Figure 22 breaks down various events on the Google Merch Shop website during the analysed period. The most frequent event, "view\_promotion," occurred 2 million times, indicating extensive user engagement with promotions. This highlights the importance of promotions in capturing user attention. The "page\_view" event occurred 1.2 million times, showcasing active exploration of the website's content.



Figure 23. View by Page Path and Screen Class

In Figure 23, the "Home" page, with 238,000 views, serves as the primary entry point for numerous users on the Google Merch Shop website. With 72,000 views, the "Shopping Cart" page, on the other hand, shows a positive intention to make purchases as well as an active product selection.



*Figure 24. Conversions: Event Name*

Figure 24 shows key steps in the conversion process that are associated with successful conversions or desired outcomes. These recorded conversion events were made on the Google Merch Shop website during the specified period.

#### **4. Discussion**

The analysis reveals several key insights that can inform strategic decisions for the Google Merch Shop website. The strong presence of the website in the United States suggests a need for region-specific marketing strategies and targeted promotions. The predominantly male user base presents an opportunity to diversify product offerings to appeal to female users. Additionally, the analysis suggests that users are interested in value shopping, which can be leveraged with aggressive discounts and promotions.

The analysis of user behaviour over time, including anomalies in user acquisition, engagement, and conversion events, can provide insights into the effectiveness of marketing campaigns and seasonal trends. By identifying successful strategies and their impact on user behaviour, the website can optimise marketing efforts and enhance user experience.

In conclusion, the analysis of the Google Merch Shop website's data provides valuable insights into user behaviour, engagement, and overall website performance. By comprehending user preferences, recognising seasonal trends, and identifying the impact of successful marketing campaigns, the website can maintain its effectiveness in attracting and engaging its audience. Leveraging these insights, the Google Merch Shop can solidify its position as a prominent online merchandise destination, ensuring continued growth and relevance in the market. This analysis underscores the importance of data-driven decision-making for online businesses and the significance of Google Analytics as a tool for understanding user behaviour.



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## Appendix

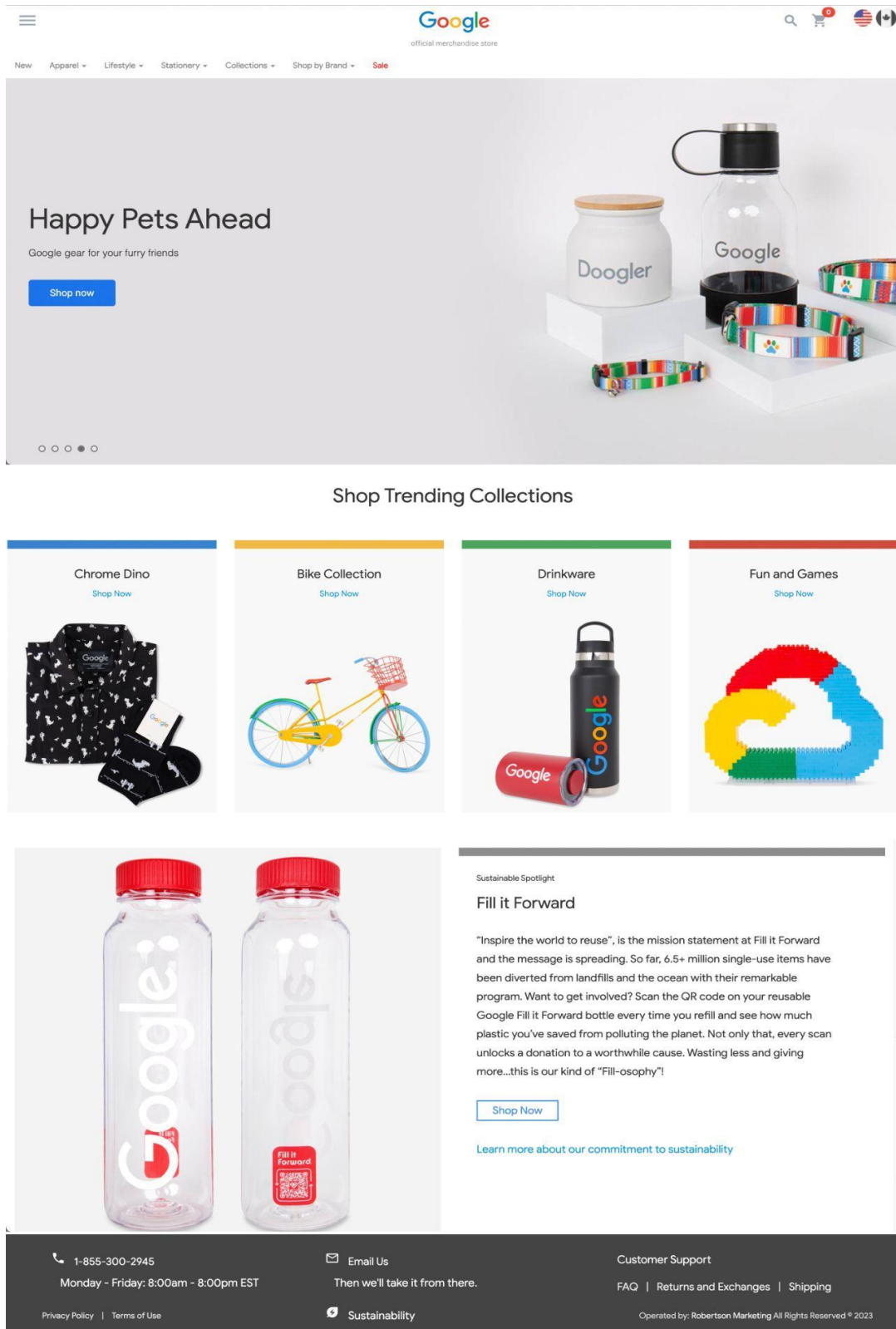


Figure 25. Google Merch Shop's website



*“If we knew what it was we were doing, it would not be called research, would it?”*

— Albert Einstein