Curriculum, Practice, and Diet Predict Health Among Experienced *Taiji* and *Qigong* Practitioners

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Abstract

Objective: To explore the potential influence of curriculum, frequency of practice, and dietary quality on the health of experienced *Taiji* and *qigong* practitioners.

Design: Theoretical and cross-sectional study.

Methods: Responses from a volunteer sample of *Taiji* practitioners from across the United States were collected using an online survey. The instrument was designed to collect data on health-related quality of life, diet, and *Taiji* practice regimens. All experienced (≥ 4 years) practitioners ($n = 94$; mean age, 55.82 years [range, 24–83 years]) were included in the analysis. Relationships among self-reported health, diet, experience, practice frequency, and curricular complexity were analyzed.

Results: Practitioners' health status did not show the typical negative association with age and was positively associated with complex curricula, practice, and high-quality diets. Significant interaction effects were seen between (1) curricular complexity and additional practice ($p < 0.05$) and (2) curricular complexity and diet ($p < 0.05$).

Conclusions: Intervention designers, *Taiji* teachers, and practitioners should consider the potential influence of curricula, out-of-class practice, and healthy diets for optimizing health-related gains and minimizing age-related losses in interventions and community-based programs.

Introduction

THE SOCIAL AND MEDICAL ADVANCES of the last century have greatly reduced death by acute diseases and extended longevity in the United States. This human victory over early childhood death, malnutrition, and illness is to be celebrated because it provides more individuals opportunities to accomplish their personal dreams and to experience long, fulfilling lives. This situation also gives societies increased chances to benefit from the experiences of older individuals, as never before in human history have so many skilled, wise, and educated people lived so long. Yet, these same advances in Western medicine and science have created a multilevel challenge, as societies with increasing proportions of old people are experiencing high rates of age-related chronic and comorbid conditions, which are not well treated with conventional medicine.¹

During the past decade, research on mind–body modalities and the mechanism of connection has substantially increased. *Taiji* and *qigong* (TQG) have been classified by the National Institutes of Health as forms of mind–body medicine and are being used to treat, or complement treatment of, a wide range of chronic conditions.^{2,3} Numerous reviews and meta-

analyses have concluded that these practices have many mental and physical health benefits relevant to longevity and well-being across the lifespan.^{4–6}

Yet, many questions remain about the mechanisms and processes that could lead to such multidimensional benefits, and there is a general lack of clarity about the specifics of practice routines—the terms *taijiquan* and *qigong* are commonly used to describe mind–body exercise routines that may vary greatly in actual composition.⁷ Such routines might contain a one or more practices, including, but not limited to, seated, standing, and lying-down meditations; iterative moving meditations; choreography; and/or partner training.⁸ Yet, meta-analyses continue to make claims about effectiveness or ineffectiveness of TQG practices by compiling and analyzing data from dissimilar protocols.

In addition to the need for more clarity in reporting of protocol, little known is known about optimal “dosage” (i.e., frequency and intensity of practices) in protocol.⁷ Although some investigators have hypothesized outcomes on the basis of the specifics of their protocols,⁹ evidence for differential effects of specific practices or curricula has not been reported in the scientific literature.

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Attending to the effects of curriculum on protocol outcome can help the clinical and scientific communities strengthen their theoretical understanding of TQG practices, advance a valid and reliable knowledge base of practice effects, and optimize protocol to better meet individual and special needs.

While most of TQG protocol yield some benefit,⁴ traditional practice theory suggests that the range and degree of benefits is closely related to curricula (content, dose, and intensity).⁸ Such expectations are also in line with contemporary theories in the field of developmental science and health. For instance, the lifespan model of health behavior and optimal aging suggests that engaging in behaviors such as exercise, mindfulness, emotion regulation, and healthy eating habits can, over time, positively influence health and decelerate or buffer aging processes.¹⁰ An earlier paper reported on the health status of a deliberate sample of 120 TQG practitioners in the United States, finding that they displayed remarkably high health status regardless of age, income, and education level.¹¹

The current study seeks to expand on the authors' earlier analysis to explore the influence of curriculum and diet on an experienced (≥ 4 years of practice) subset of TQG practitioners ($n=94$) from the last study.

On the basis of traditional wisdom and the theory cited above, the hypothesis was that factors such as curricular complexity, practice frequency, and diet quality would predict health status among experienced practitioners. In other words, practitioners with richer curricula, regular practice, and healthy diets should, on average, be among the healthiest of their peers. Yang et al also suggested that special "efficiency" effects may be achieved when curricula are sufficiently complex, allowing practitioners to maximize the benefits of their practice time.⁸ Thus, a potential interaction between curricular complexity and practice frequency on health is also hypothesized.

Finally, both contemporary Western science and classic Chinese theories of *qi* emphasize the importance of diet as a basic building block of health. Moreover, dietary quality has been theorized to have age-accelerating or -decelerating effects. Thus, it is reasonable to expect that diet quality would be a substantive and significant predictor of health in TQG practitioners. Yet, in certain *Taiji* circles, stories or beliefs persist that diet does not affect the health of *Taiji* masters. This study explores interactions between diet and curricular complexity in a sample of experienced TQG practitioners.

Materials and Methods

Data collection and sampling

The *Taiji* Symposium Research Survey (TSRS) was a web-based survey designed to collect self-reported data on community TQG practitioners. Its aims were to provide details about practitioners' health, lifestyle, practice routines, and demographic characteristics. Detailed information on the survey instrument and data collection procedures was reported previously.¹¹ The current analysis focuses on a subset ($n=94$) of the original sample who reported attending class or practicing outside of class 3 or more days a week and had at least 4 years of practice experience. These selection criteria were set to ensure that practitioners had been practicing long enough and frequently enough so that the study could detect the potential effects of curriculum on their health status. The participants' ages ranged from 24 to 83 years (Table 1), and the average age was 55.82 years (Table 2).

Variables

Table 1 provides details on the variables of interest in this analysis. The primary dependent variable was self-reported health status, measured on a five-point Likert scale ranging from poor (0) to excellent (4). Health is considered a

TABLE 1. VARIABLE ROLES, NAMES, DESCRIPTIONS, AND CODES FOR CURRICULAR ANALYSES OF *TAIJI* SYMPOSIUM RESEARCH SURVEY DATA

Variable	Description	Code
Health status	Continuous variable indicating self-reported health	0 = poor 1 = fair 2 = good 3 = very good 4 = excellent
Curricular complexity	Continuous variable created by totaling all domains in which practitioners indicated "regularly practicing." This total score is referred to as curricular complexity. Domains include: still meditation, iterative movement, choreography, and partner training.	1 = one domain 2 = two domains 3 = three domains 4 = four domains
Practice frequency	Continuous variable indicating average number of weekly practices by oneself or with a peer	0–17.5 sessions/wk ^a
Dietary quality	Continuous variable indicating health of diet. 0 = daily intake of fast foods, junk foods, and overeating; 3 = several servings of fresh fruits and vegetables daily, healthy sources of protein and calcium, whole grains, no regular intake of fast or junk foods.	0 = very unhealthy 1 = somewhat unhealthy 2 = healthy 3 = very healthy
Experience	Continuous variable indicating years of experience at time of data collection (2009)	4–42 y
Age	Continuous variable indicating years since birth	24–83 y

^aAverage practice duration $\pm$ standard deviation, 54 ± 27 minutes.

TABLE 2. CHARACTERISTICS OF *TAIJI* SYMPOSIUM RESEARCH SURVEY SUBSAMPLE BY CURRICULAR COMPLEXITY

Characteristics	Practice domains (curricular complexity)				Total
	1	2	3	4	
Total participants, <i>n</i> (%)	7 (7.45)	22 (23.40)	33 (35.11)	32 (34.04)	94 (100)
Age					
Participants (<i>n</i>)	6	20	33	32	91
Mean (y)	56.83 ± 4.79	55.65 ± 10.03	57.88 ± 9.68	53.63 ± 11.53	55.82 ± 10.24
Range (y)	49–62	31–74	36–83	24–72	24–83
Health status					
Participants (<i>n</i>)	7	22	33	32	94
Mean	2.71 ± 0.95	3.09 ± 0.68	3.09 ± 0.80	3.50 ± 0.72	3.20 ± 0.78
Range	1–4	2–4	1–4	2–4	1–4
Dietary quality					
Participants (<i>n</i>)	7	22	33	32	94
Mean	2.14 ± 0.69	2.14 ± 0.64	2.21 ± 0.60	2.34 ± 0.70	2.23 ± 0.65
Range	1–3	1–3	1–3	1–3	1–3
Practice frequency					
Participants (<i>n</i>)	7	22	33	32	94
Mean	3.21 ± 1.63	4.48 ± 2.16	4.41 ± 2.13	5.05 ± 3.12	4.55 ± 2.50
Range	2–6	1–9	0–10	0–17.5	0–17.5
Experience					
Participants (<i>n</i>)	7	22	33	32	94
Mean (y)	10.71 ± 4.75	13.50 ± 7.21	16.61 ± 10.93	18.69 ± 11.45	16.15 ± 10.21
Range (y)	5–20	5–34	4–41	4–42	4–42

Values expressed with a plus/minus sign are the mean ± standard deviation.

multidimensional construct encompassing physical, psychological, and social dimensions of health. It is also a significant predictor of mortality and hospitalization and has strong associations with key indicators of successful aging.^{10,12} The predictor variables were curricular complexity, practice frequency, and dietary quality.

Curricular complexity was a continuous variable determined by a model developed to operationalize existing paradigms in the TQG practice literature.^{4,8} the use of curriculum in this study does not refer to a particular style but rather to the specific contents or domains of practice. This model divides practices into four domains. Each domain is thought to have cumulative and independent effects on health. The four domains are (1) stillness practices, which includes seated, standing, and lying-down meditation; (2) iterative practices, in which simple movements are practiced repeatedly and meditatively as mantra of the body; (3) choreography, which represents sequential *Taiji* movements of various lengths; and (4) partner and prop training, in which participants are taught to overcome challenges to equilibrium and equanimity. This model was operationalized with a simple summative four-point scale; each point accounted for the presence or absence of one of four practice domains discussed above. Thus, it roughly approximates the degree of complexity in practitioners' routine or curriculum. The contents of each participant's practice rather than TCG style were analyzed because many of the practitioners in the sample reported practicing multiple styles of *Taiji* and qigong, an issue that would threaten the validity of a variable based on style of practice.

The value of the practice frequency variable was obtained through simple self-report of number of times that an individual practiced outside of class on his or her own or with peers. As seen in Table 2, the average practice frequency for

this sample was 4.55 times per week, with an average duration (standard deviation) of 54 ± 27 minutes per session.

Dietary quality was a continuous variable representing a score for self-reported diet. Dietary scores were assessed according to a simple self-rated four-point scale ("poor" to "excellent"), where "poor" indicated daily intake of fast foods, junk foods, and frequent overeating and "excellent" indicated a diet composed mostly of fresh fruits and vegetables, healthy sources of protein and calcium, whole grains, rare consumption of fast or junk foods, and infrequent overeating.

Sample characteristics

Table 2 shows the characteristics of the subsample for the variables of interest. Numbers of men and women were

TABLE 3. BIVARIATE CORRELATIONS AMONG STUDY VARIABLES (*N* = 94)

Variable	1	2	3	4	5	6
1 Health status						
2 Curricular complexity	0.275**					
3 Practice frequency	0.203*	0.166				
4 Dietary quality	0.330**	0.123	0.249*	—		
5 Age ^a	0.119	−0.093	0.061	0.120		
6 Experience	0.184	0.242*	0.165	0.031	0.253*	—

^a*n* = 91 cases due to missing data.

**p* < 0.05.

***p* < 0.01.

TABLE 4. ANALYSIS OF VARIANCE SOURCE TABLE AND REGRESSION SUMMARY OF HEALTH STATUS, DIET, AND CURRICULUM

Source	Type III SS	df	M ²	F	p-Value
Age	0.090	1	0.090	0.184	
Experience	0.186	1	0.186	0.381	
Curricular complexity	0.072	1	0.072	0.146	
Practice frequency	2.800	1	2.800	5.726	<0.05
Dietary quality	0.694	1	0.694	1.419	
Practice frequency × curricular complexity	2.574	1	2.574	5.262	<0.05
Dietary quality × curricular complexity	2.146	1	2.146	4.389	<0.05
Model	15.014	7	2.145	4.386	<0.01
Error	40.591	83	0.489		
Total	55.604	90			

Independent variables	General health status				
	B	SE B	β	t	p-Value
Intercept	2.415	1.209		1.998	<0.05
Age	0.003	0.008	0.043	0.429	
Experience	0.004	0.008	0.063	0.617	
Curricular complexity	-0.130	0.340	-0.152	-0.383	
Practice frequency	0.274	0.115	0.877	2.393	<0.05
Dietary quality	-0.519	0.436	-0.422	-1.191	
Practice frequency × curricular complexity	-0.076	0.034	-0.970	-2.294	<0.05
Curricular complexity × dietary quality	0.283	0.135	1.105	2.095	<0.05
R ²	0.270 *				

* $p < .01$.

df, degrees of freedom; SS, sum of squares; SE B, standard error of B, an estimate of the regression coefficient.

roughly equal, and bivariate correlations did not indicate significant health differences by biological sex, so this variable is not included in the analysis. The data in Table 2 show that on average, members of this sample were experienced practitioners (range, 4–42 years of practice; average experience, 16.15 years). This sample also practiced frequently enough to meet or exceed the U.S. guidelines for physical

activity.¹³ The average diet score for this sample, 3.23 ± 0.65 , indicates a tendency toward healthy eating habits in this sample. Additionally, the variance in curricular complexity in this sample allows for an examination of the influence of this variable on TQG practitioner's health status.

Bivariate correlations, presented in Table 3, confirmed the relationships between health status and the predictor variables of interest (curricular complexity; $r = 0.275$; $p < 0.01$; practice frequency, $r = 0.203$; $p \leq 0.05$; dietary quality, $r = 0.330$; $p < 0.01$). The table also shows that more experienced practitioners tended to be older and to engage in more complex curricula ($r = 0.242$; $p < 0.05$), which may be related to relatively high health status found across ages. This finding contrasts with the typical negative correlation between age and health in the U.S. population.¹¹ All analyses were performed with IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY).

Analysis and Results

The study hypothesis was that health status should be significantly influenced by the complexity of the practice curriculum, frequency of practice, and relevant lifestyle and cultural or contextual factors, specifically, in this case, dietary quality. A traditional TQG practice paradigm also suggests the possibility of interaction effects between curricular complexity and practice frequency. Yang and colleagues discussed this as an efficiency effect, wherein a well-rounded curriculum may yield greater benefits in fewer practice hours. Therefore, the analysis regressed health status on age and experience along with curricular complexity, practice frequency, and diet, including three two-way interactions and a three-way interaction. Three-way interaction and a two-way interaction between practice frequency and dietary quality were nonsignificant at the 0.05 level and were removed from the model. Then, two two-way interactions, curricular complexity by practice frequency and curricular complexity by dietary quality, were examined. Table 4 displays the results of the final regression model.

The model (Table 4) accounted for 27% of the variance in health status. As hypothesized, curricular complexity, practice frequency, and diet quality were all significant predictors of health, but each was also involved in significant interactions, such that their individual effects can be interpreted only across levels of the other variables. Statistically significant interactions were seen between curricular complexity and diet quality ($t = 2.095$; $p = 0.039$) and between curricular complexity and practice frequency ($t = 2.294$; $p = 0.024$).

FIG. 1. Relationship between health status (general health) and curricular complexity for varying degrees of practice frequency (Prac-Freq). Curricular complexity ranges from one to four domains. Low practice frequency = 2.05 practices per week (1 standard deviation [SD] below the mean). Medium practice frequency = mean of 4.55 practices per week. High practice frequency = 7.05 practices per week (1 SD above the mean).

FIG. 2. Relationship between health status (general health) and curricular complexity for varying degrees of dietary quality. Curricular complexity ranges from one to four domains. Diet 1=somewhat unhealthy, diet 2=healthy, diet 3=very healthy. See Tables 1 and 2 for more information about diet. No participant was at diet 0 (very unhealthy) in the sample; thus, that value is not depicted.

Figures 1 and 2 depict the relationships between health status and curricular complexity or diet, respectively, for the three practice groups.

Discussion

Although these cross-sectional data prevent assertions about the causal influence of TQG practices and dietary quality on health, the study sample, design, and results support the notion that these practices are beneficial. Specifically, by analyzing the association between practice-related variables and health among experienced (as compared with novice) practitioners, one can begin to rule out the alternative explanation that good health leads to more frequent and more efficient practice. This is particularly so when considering the broad age range of this sample of experienced practitioners and the fact that the health status of this sample did not show the typical negative correlation with their age, as evinced in the average U.S. population.

Support was also found for the efficiency effects of complex curricula. As shown in Figure 1, the average health of individuals engaged in more complex curricula was higher than that of participants engaged in more simplistic curricula when practicing 4–5 times per week; the health status of individuals practicing 7 or more times per week was similar regardless of curricular complexity.

Future studies should continue to investigate the relationship between curricular complexity and health and related outcomes; longitudinal studies would be particularly helpful to establish with more certainty the direction of relationships. Given the small sample size, a simple total score was used to model the effects of curricular complexity. Although the findings suggested a general tendency in the benefits of complex curricula where health was concerned, future studies with larger sample sizes could test more complex models. For example, it would be possible to compare groups with various combinations of practice domains to build a stronger evidence base for the effects of specific practices or specific combinations of practices. This would also require future studies to include objective, multidimensional measures with the sensitivity to detect the specific developmental contributions of particular domain combinations.

The strong relationship between diet and health in the context of mind–body practice is another noteworthy finding in this study. Traditional Chinese Medicine maintains that food is major source of *qi* (life energy) and that the quality of one's diet influences the quality of one's energy on multi-

ple levels: physical, emotional, and cognitive.^{14,15} Findings in this study (Fig. 2) could point to a synergistic effect between high-quality diets and complex curricula, as the data show the best average health status was achieved by individuals with high-quality diets and complex practice curricula. Moreover, practitioners should consider that complexity curricula did not appear to protect the health of participants with poor diets, as participants who reported low-quality diets had the lowest health status regardless of curricular complexity.

While diet quality has not been considered in the empirical literature on TQG, dietary considerations have been addressed by several proponents of TQG and *qigong* and have long been understood in the Taoist roots of these traditions to be important to healthy longevity.^{14,15} Diet is also recognized in lifespan developmental sciences as a key factor in disease and aging processes.¹⁰ The lack of a significant association between diet and experience in this sample (Table 3) may indicate that the issue of diet, despite its historical importance to Taoism, is not as explicitly discussed in all TQG communities. Nevertheless, quality of diet does seem to be relevant to many practitioners in this sample, as shown by the average dietary score of 2.23 out of 3, indicating infrequent consumption of fast foods and daily consumption of fresh fruits and vegetables. Although this study did not include variables related to the use of traditional Chinese herbs and other supplements, accounting for the use of these in future research may provide for a stronger model.

Another remarkable finding was that age was not negatively correlated with health of the experienced TQG practitioners in this sample. Yet, the negative correlation between age and health status in U.S. populations is well established and indicates a situation where everyday activities are testing the limits of the mental and physical abilities of most older adults.¹⁶ From the perspective of traditional TQG and Chinese medical theory, the health profile of this sample is not remarkable; rather, it is what one should expect to see given the factors present in the population. These findings also fit well with a more contemporary Western evidence-based paradigm, the lifespan model of health behavior and optimal aging.¹⁰

This model suggests that optimizing the aging process takes time and attention to two broad categories of behaviors: age accelerators and age decelerators. Age accelerators include activities that negatively affect individual organ systems, thereby causing systemic dysfunction; these include exposure to toxins, such as excessive alcohol consumption, and prolonged negative emotional mood states, which impair

neurologic and immune system function and are further tied to cardiovascular diseases. Age decelerators are behaviors or dispositions of individuals that seem to buffer against stress, promote resilience, and provide a sense of meaning or control. Examples of age decelerators are mindfulness, emotional regulation, and exercise. The lifespan model also emphasizes that health is affected not only by acute medical conditions but also by cumulative and long-term exposure to entropic age-accelerating factors and nurturing age-decelerating factors.

Many of the individual practices that make up a well-rounded TQG curriculum are known to effect these very aspects of development.^{4,17–19} Thus, over an extended period the cultivation of expertise in a well-rounded TQG curricula may buffer or create resilience to the typical age-related declines in functional health observed in the general population. The findings in this study demonstrate the merits of further investigating this possibility through longitudinal research.

In conclusion, the use of a curricular complexity model based on practice domains was effective for predicting differences in the health status of TQG practitioners. If such differences are detectable in a gross measure, such as self-reported health, comparative studies using more sensitive and dimension-specific measures are worth pursuing. Such studies are essential to the development of best practices and specialty protocols to meet the needs of individuals with specific health conditions. Additionally, research engaged in clinical TQG research should consider the potential dietary interaction effects as influences on study outcomes. At the very least, diet should be assessed, and where *Taiji* protocols are designed to maximize health outcomes, modules on nutrition education and mindful eating may be useful and necessary to optimizing results. Finally, the significant relationships between curricular complexity, practice frequency and health status highlight the need for investigators to report intervention protocols in greater detail. These findings also raise questions about the validity of any meta-analysis of TQG outcomes that does not consider protocol differences or curricular complexity.

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Author Disclosure Statement

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