Taijiquan Exercise Cultural Inheritance System Fuzzy Comprehensive Evaluation Research

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Abstract: Fuzzy comprehensive evaluation can eliminate multiple uncertain factors, and get accurate score zone, on this basis, the paper combines with fuzzy comprehensive evaluation to evaluate on Taiji types of exercises culture, during solving process, the paper firstly establishes factor set, including paying attention to life and humanistic thoughts, moral education, harmonious philosophy of life, tough and tenacious characters these four main fields. And establish detailed evaluation set, evaluate on future view of life, humanistic thoughts impacts, carrying out and implementation of harmonious society, anti-setback capacity as well as other aspects in inheritance of traditional cultural Taiji types of sports culture, and get that China’s traditional culture is of very high contributions to contemporary life and social values.

Keywords: Cultural inheritance, fuzzy comprehensive evaluation, fuzzy evaluation, public health, Taijiquan.

1. INTRODUCTION

Taijiquan affiliates to China’s traditional boxing, it continues today that has very high impacts, and nowadays is widely spreading to multiple countries and regions. In process of the publicity of Taijiquan, China holds “International Taijiquan (sword), push-hands competition” every year, Taijiquan was formal listed as competition event in Beijing Asian Games in 1990 [1]. With vigorously publicity of Taijiquan, followed by releasing of policies of “national fitness”, it is even popular among men and women at all ages [2, 3].

By Table 1, it gets that Taiji exercises and adapted age group, on one hand, it shows that Taiji exercise can play good promotions to middle and aged people health, physically and psychologically, it can improve citizens’ overall quality [4, 5].

Table 1. Taiji exercise and age group.

<table>
<thead>
<tr>
<th>Age</th>
<th>45-59</th>
<th>Above 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start to exercise</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>Gradually adapt</td>
<td>120</td>
<td>110</td>
</tr>
<tr>
<td>Adapted stage</td>
<td>130</td>
<td>120</td>
</tr>
<tr>
<td>Remaining stage</td>
<td>130-140</td>
<td>120-130</td>
</tr>
</tbody>
</table>

2. MODEL ESTABLISHMENTS

Utilize fuzzy comprehensive evaluation, steps are as following:

(1) Establish factor set $U : U = (U_1, U_2, \ldots, U_4)$

(2) Establish judgment set $V$ (evaluation set), $V = (V_1, V_2, \ldots, V_n)$

According to general evaluation system, define evaluation grade domain: $V = \{V_1, V_2, V_3, V_4\}$

(3) Establish judgment matrix fuzzy mapping from $U$ to $V$, it gets fuzzy relation as following matrix shows.

At first, for anyone $u_i$ in several factors, make a evaluation $f(u_i) = (r_{i1}, r_{i2}, \ldots, r_{in}) \in F(V)$

By fuzzy mapping, it gets fuzzy relations:

$$R = \begin{bmatrix}
    r_{11} & r_{12} & \cdots & r_{1n} \\
    r_{21} & r_{22} & \cdots & r_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    r_{m1} & r_{m2} & \cdots & r_{mn}
\end{bmatrix}$$

Fuzzy relation $R$ every line reflects the line influence factors to object judgment extent, and meanwhile, $R$ every column reflects the column influence factors to object judgment extent (MA et al., 2012).
Table 2. Taiji types of sports culture inheritance evaluation indicator system.

<table>
<thead>
<tr>
<th>Pay Attention to Life and Humanistic Thoughts $U_1$</th>
<th>Constant Virtues Moral Education $U_2$</th>
<th>Harmonious Social Life Philosophy $U_3$</th>
<th>Tough and Tenacious Cultural Characters $U_4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future rational life view $u_{11}$</td>
<td>Population education degree $u_{21}$</td>
<td>Harmonious phenomena ratio $u_{31}$</td>
<td>Youth anti-setback capacity $u_{41}$</td>
</tr>
<tr>
<td>Contemporary life values $u_{12}$</td>
<td>General mood of provisions for aged $u_{22}$</td>
<td>Reference of general mood of moderation $u_{32}$</td>
<td>Anti-setback capacity $u_{42}$</td>
</tr>
<tr>
<td>Contemporary life entry view $u_{13}$</td>
<td>Taijiqun influences scopes amount $u_{33}$</td>
<td>Advocate and implement harmonious society $u_{33}$</td>
<td>Social advocating of general mood of tough and tenacious $u_{43}$</td>
</tr>
<tr>
<td>Gender discrimination $u_{14}$</td>
<td>Reflection of philosophy phenomena $u_{34}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humanistic thoughts impact $u_{15}$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(4) Establish weight sets, $A=(a_1, a_2, \cdots, a_n) \in F(U)$, it meets conditions: $\sum_{i=1}^{n} a_i = 1$, $a_i \geq 0$

$$B = A \cdot R$$

$$= (a_1, a_2, a_3, \cdots, a_n) \cdot \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}$$

$$= (b_1, b_2, b_3, \cdots, b_n)$$

In $V$, fuzzy combination is evaluation set $B$. Based on above described facts, actual change model is as Fig. (1):

![Fig. (1). Changed model.](image)

Evaluation factors $U_1$, $U_2$, $U_3$, $U_4$, $U_5$ membership functions can be expressed as following:

$$u_{11}(u_i) = \begin{cases} 
0.5(1 + \frac{u_i - k_i}{u_i - k_1}), & u_i \geq k_i \\
0.5(1 - \frac{k_i - u_i}{k_i - k_1}), & k_1 \leq u_i < k_2 \\
0, & u_i < k_2
\end{cases}$$

$$u_{12}(u_i) = \begin{cases} 
0.5(1 - \frac{u_i - k_i}{u_i - k_1}), & u_i \geq k_i \\
0.5(1 + \frac{k_i - u_i}{k_i - k_1}), & k_1 \leq u_i < k_2 \\
0.5(1 - \frac{k_i - u_i}{k_i - k_2}), & k_2 \leq u_i < k_3 \\
0.5(1 + \frac{u_i - k_i}{u_i - k_3}), & k_3 \leq u_i < k_4 \\
0.5(1 - \frac{k_i - u_i}{k_i - u_i}), & u_i < k_4
\end{cases}$$

Establish factor set $U$, $U = (U_1, U_2, U_3, U_4)$. Among them, $U_1$ is paying attentions to life and humanistic thoughts, $U_2$ is constant virtues moral education, $U_3$ is harmonious social life philosophy, $U_4$ is tough and tenacious characters, it gets Table 2.

The paper gets evaluation set.

$$U_1 = \{u_{11}, u_{12}, u_{13}, u_{14}, u_{15}\}; \quad U_2 = \{u_{21}, u_{22}, u_{23}\}; \quad U_3 = \{u_{31}, u_{32}, u_{33}, u_{34}\}; \quad U_4 = \{u_{41}, u_{42}, u_{43}\}$$

By collecting data and analyzing, it gets importance degree ranking statistics as Table 3.

But:

$$U_1 = \{23, 7, 3, 0\}; \quad U_2 = \{7, 18, 8, 0\}; \quad U_3 = \{0, 9, 13, 11\};$$

$$U_4 = \{3, 0, 9, 21\}$$

Obtained weighted vector from rank 1 to rank 2:

$$\beta = \{\beta_1, \beta_2, \beta_3, \beta_4\} = \{0.4, 0.3, 0.2, 0.1\}$$

$$U_1^* = U_1 \cdot \beta^T$$

$$U_1^* = 12, \quad U_2^* = 9.8, \quad U_3^* = 6, \quad U_4^* = 5$$

The paper takes normalization processing: $U_1^* = 0.35$, $U_2^* = 0.3$, $U_3^* = 0.2$, $U_4^* = 0.15$

It gets: $A = (0.35, 0.3, 0.2, 0.15)$

Through defining gets remarks membership as Table 4 shows, it evaluates on all factors.
By obtained evaluation from Taiji types of sports cultural inheritance policies impacts on urbanization, it gets Table 5.

By above model, it gets single layer indicator weight factor fuzzy set is:

\[
A_1 = \{u_{11}, u_{12}, u_{13}, u_{14}, u_{15}\} = \{0.25, 0.25, 0.2, 0.15, 0.15\}
\]

\[
A_2 = \{u_{21}, u_{22}, u_{23}\} = \{0.54, 0.34, 0.12\}
\]

\[
A_3 = \{u_{31}, u_{32}, u_{33}, u_{34}\} = \{0.4, 0.3, 0.1, 0.2\}
\]

\[
A_4 = \{u_{41}, u_{42}, u_{43}\} = \{0.3, 0.4, 0.3\}
\]

By researching, it gets evaluation sets of paying attentions to life and humanistic thoughts, moral education, harmonious social life philosophy, tough and tenacious characters.

Pay attention to life and humanistic thoughts:

\[
R_1 = \begin{pmatrix}
0 & 0.05 & 0.9 & 0.05 \\
0.05 & 0.9 & 0.05 & 0
\end{pmatrix}
\]

Moral education:

\[
R_2 = \begin{pmatrix}
0 & 0 & 0.05 & 0.95 \\
0.05 & 0.9 & 0.05 & 0
\end{pmatrix}
\]
Table 6. Taiji sports culture overseas development.

<table>
<thead>
<tr>
<th>Question Designing</th>
<th>Answers Options</th>
<th>Identification</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coach</td>
<td>Quantity</td>
<td>Proportion</td>
</tr>
<tr>
<td>Taijiquan routines</td>
<td>Move 1-8</td>
<td>12</td>
<td>5.5%</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Move 9-16</td>
<td>12</td>
<td>5.6%</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Move 17-24</td>
<td>27</td>
<td>12.3%</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Move 25-32</td>
<td>16</td>
<td>6.4%</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Above move 32</td>
<td>167</td>
<td>70%</td>
<td>158</td>
</tr>
<tr>
<td>Basic skill movement</td>
<td>Single move</td>
<td>74</td>
<td>42.3%</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Standing exercise</td>
<td>61</td>
<td>34.9%</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>35</td>
<td>19.6%</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>6</td>
<td>3.56%</td>
<td>29</td>
</tr>
<tr>
<td>Sports that one feels is difficult</td>
<td>One movement</td>
<td>21</td>
<td>11.65%</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>One routine</td>
<td>78</td>
<td>40.46%</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Understand its cultural backgrounds</td>
<td>56</td>
<td>28.65%</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Else</td>
<td>36</td>
<td>16.97%</td>
<td>12</td>
</tr>
<tr>
<td>Movements that one love</td>
<td>Clothes</td>
<td>35</td>
<td>19.6%</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Sports form</td>
<td>2</td>
<td>0.03%</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Rhythm</td>
<td>15</td>
<td>8.5%</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Cultural backgrounds</td>
<td>116</td>
<td>66.48%</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Else</td>
<td>18</td>
<td>6.84%</td>
<td>14</td>
</tr>
</tbody>
</table>

Harmonious social life philosophy:

\[
R_3 = \begin{pmatrix}
0 & 0 & 0.05 & 0.95 \\
0 & 0.05 & 0.9 & 0.05 \\
0 & 0.05 & 0.9 & 0.05 \\
0.05 & 0.9 & 0.05 & 0
\end{pmatrix}
\]

Tough and tenacious characters:

\[
R_4 = \begin{pmatrix}
0 & 0 & 0.05 & 0.95 \\
0 & 0 & 0.05 & 0.95 \\
0 & 0.05 & 0.9 & 0.05 \\
0.05 & 0.9 & 0.05 & 0
\end{pmatrix}
\]

\[
B_i = A_i \cdot R_i
\]

Make normalization processing with obtained \( B_i \), it gets second layer fuzzy evaluation matrix:

\[
\tilde{B} = \begin{pmatrix}
B_1 \\
B_2 \\
B_3 \\
B_4
\end{pmatrix} = \begin{pmatrix}
0.065 & 0.155 & 0.367 & 0.4945 \\
0.0057 & 0.1452 & 0.3455 & 0.5350 \\
0.0112 & 0.2012 & 0.3845 & 0.3964 \\
0.0356 & 0.3150 & 0.6253 & 0.0154
\end{pmatrix}
\]

\[
Z = A \cdot \tilde{B} = \begin{pmatrix}
0.0323 & 0.1766 & 0.3981 & 0.4166
\end{pmatrix}
\]

Fuzzy comprehensive evaluation model eliminates traditional evaluation models drawbacks, it not only simplifies calculation but also fully considers research objects owned systematic and comprehensive features. By above results indication, it gets comprehensive value Z ratio in the interval of 90-100 is bigger, so evaluation result is good.

Finally, the paper adjusts and sorts out obtained evaluation that Taiji sports culture goes abroad according to following data it gets Table 6 that even sufficiently reflects Taiji sports culture good inheritance and development.

**CONCLUSION**

By establishing attribute scale for one object, carrying out fuzzy mathematical analysis of one object, initially analyzed object should have fuzziness or uncertain attributes. So the paper researches on Chinese government promotions to Taiji types of sports culture inheritance development according to fuzzy comprehensive evaluation. Then evaluate on future life view, humanistic thoughts impacts, carrying forward and implementation of harmonious society, anti-setback capacity and others multiple aspects, and get that China’s traditional culture is of very high contributions to contemporary life and social values.
CONFLICT OF INTEREST
The authors confirm that this article content has no conflict of interest.

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REFERENCES


