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Research Article

EDAS Method for Single-Valued Neutrosophic Number Multiattribute Group Decision-Making and Applications to Physical Education Teaching Quality Evaluation in Colleges and Universities

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The evaluation of undergraduate teaching levels by the Ministry of Education has greatly promoted the construction of software and hardware in universities. After the evaluation, it will be a long-term task to build a long-term decision-making mechanism to guarantee the continuous improvement of teaching quality. As an important part of university education, physical education (PE) has always played an irreplaceable role in improving current students' physical quality and cultivating their awareness of lifelong physical exercise. How to establish and improve the quality evaluation information system of PE to guarantee the quality of PE is not only related to the awareness of physical education workers about their own teaching work but also to the effective means to regulate the quality monitoring of PE. An effective PE quality evaluation system depends not only on the teaching management department but also on the evaluation of teaching by students and teachers themselves. Only in this way can PE classroom teaching quality be comprehensively and truly reflected. The evaluation of PE quality in higher education is often considered as a multiattribute group decision-making (MAGDM) problem. In this article, the EDAS model is extended to the single-valued neutrosophic sets (SVNSs) setting to deal with MAGDM and the computational steps, for all designs are listed. Finally, the PE quality evaluation is given to prove the SVNN-EDAS model and some good comparative analysis is done to demonstrate the advantages of SVNN-EDAS. It is shown that the SVNN-EDAS method emphasizes the expectation value of the SVNN average alternative. Compared with different methods mentioned, the SVNN-EDAS method is more practical and efficient because the calculation steps are simpler and easier to apply in practice.

1. Introduction

Decision-making is a human thought activity. With the help of scientific decision methods, decision-making experts sort out these decision alternatives and select the best one to derive people's desired goals [1–3]. During the society development, the fast development of information technology, the environment facing human beings is becoming more and more complex, and the problems to be solved are becoming more and more diverse [4–6]. In the past, people used a single criterion to make decisions [7–9]. Complexity requires decision-making activities under multiple irreplaceable criteria, and the MADM problem emerges as the times require [10, 11]. MADM has a wide applications in society, economy, enterprise, urban management, ecological environment, energy system engineering, transportation system, agricultural system engineering, education system, and military system engineering [12–14]. The MAGDM is decision research direction of connection between MADM and GDM [15–17]. Therefore, the studies of MAGDM have high practical value [18–20]. Thus, fuzzy sets (FSs) [21] are produced for MAGDM [22, 23]. Then, as an extension, intuitionistic FSs (IFS) [24] were used for MAGDM. Smarandache [25] devised the neutrosophic sets

(NSs). For practical application, the SVNSs [26] and INSs [27] were depicted as subclasses of NSs. Deli and Şubaş [28] defined the new ranking method of SVNNs. Deli [29] defined the defuzzification of SV-trapezoidal neutrosophic numbers for MADM. Deli [30] defined linear optimization algorithms for SVNNs and their sensitivity analysis. Deli [31] defined some operators with IVGSVTrN-numbers for MAGDM.

Teaching quality is an eternal theme of college construction and development, especially in the current transitional period when higher education is gradually transitioning from elite education to mass education [32–34]. PE is a goal-oriented activity. PE teachers are the leaders of real-life teaching activities. The teaching quality of PE teachers directly affects students' interest in participating in physical activities, the effect of mastering physical knowledge and skills, and even lifelong PE thoughts. With the further deepening of the reform of PE, teaching quality monitoring and evaluation have become an effective means to test the results of the above-mentioned teaching reform [37–39].

There are three mentioned shortcomings for MAGDM with SVNNs which form our defined incentives as follows:

(1) The existing decision methods have complex computation degrees [40–51]. How to study the novel decision methods with simpler computation is an interesting topic. For this given reason, the first study incentive is to design the novel, relatively simpler decision methods.

(2) The existing weight decisions only consider completely known decision weight [52–57]. How to study the weight with completely unknown weight is also an interesting issue. For this mentioned reason, the second study incentive is to produce the novel weight decisions, which could cope with completely unknown decision weight.

(3) Teaching quality is the eternal theme of college construction and development, especially in the current transitional period when higher education is gradually transitioning from elite education to mass education[58–62]. Therefore, it is urgent to design exploratory research to enrich the research methods of PE teaching quality evaluation. The PE teaching quality evaluation tool is the MAGDM. Thus, the third defined incentive is to produce novel methods for PE teaching quality evaluation.

On this basis, connected with the obvious characteristics of PE teaching quality, a novel MAGDM for PE teaching quality evaluation in SVNNs is defined. Specific research contents are shown as follows:

(1) In this defined article, the SVNN-EDAS is produced with the EDAS method [63–67] and SVNNs with a completely unknown decision weight. The SVNN-EDAS analyzed the decision methods with distance measures.

(2) For producing the completely unknown weight, the CRITIC [68] is used to decide the weights. Then, combining EDAS with given SVNNs, the SVNN-EDAS is designed for MAGDM.

(3) The main advantages of SVNN-EDAS are designed: the derived results with SVNN-EDAS are stable, and the calculating steps are simpler. Hence, the SVNN-EDAS is a good mean to obtain reasonable decision results.

(4) Finally, a numerical example for PE teaching quality evaluation was supplied, and some comparisons are provided to show the SVNN-EDAS. This article mainly lists decision guidance for SVNN-EDAS. This method has far-reaching values for PE teaching quality evaluation.

The reminder of this article is given. The SVNNSs are introduced in Section 2. Several fused operators of SVNNs are in Section 3. The SVNN-EDAS is devised for MAGDM in Section 4. The PE teaching quality evaluation is given to show the SVNN-EDAS, and some comparative analyses are devised in Section 5. At last, the satisfied conclusion analysis is drawn in Section 6.

2. Preliminaries

Wang et al. [26] produced the SVNSs.

Definition 1 see ([26]). The SVNSs with A in Θ are given as follows:

$$A = \{(\theta, AT(\theta), AI(\theta), AF(\theta)) \mid \theta \in \Theta\}, \tag{1}$$

where $AT(\theta), AI(\theta),$ and $AF(\theta)$ depict truth membership, indeterminacy membership, and falsity membership, respectively, where $AT(\theta), AI(\theta), AF(\theta) \in [0,1]$, and $0 \leq AT(\theta) + AI(\theta) + AF(\theta) \leq 3$.

Definition 2 see ([69]). Let $X = (XT, XI, XF)$; the score value is produced as follows:

$$SV(X) = \frac{(2 + XT - XI - XF)}{3}, S(X) \in [0,1]. \tag{2}$$

Definition 3 see ([69]). Let $X = (XT, XI, XF)$; the accuracy value is produced as follows:

$$HV(X) = XT - XF, H(X) \in [-1,1]. \tag{3}$$

Peng et al. [69] devised the order relation for SVNNs.

Definition 4 see ([69]). Let $X = (XT, XI, XF)$ and $Y = (YT, YI, YF)$, let $SV(X) = ((2 + XT - XI - XF)/3)$ and $SV(Y) = ((2 + YT - YI - YF)/3)$, and let $HV(X) = XT - XF$ and $HV(Y) = YT - YF$. If $SV(X) \prec SV(Y)$, we obtain: $X \prec Y$; if $SV(X) = SV(Y)$, we obtain as follows: (1) if $HV(X) = HV(Y)$, we obtain $X = Y$; (2) if $HV(X) \prec HV(Y)$, we obtain $X \prec Y$.

Definition 5 see ([26]). Let $X = (XT, XI, XF)$ and $Y = (YT, YI, YF)$; the operations are as follows:

(1) $X \oplus Y = (XT + YT - XT \cdot YT, XI \cdot YI, XF \cdot YF)$

(2) $X \otimes Y = (XT \cdot YT, XI + YI - XI \cdot YI, XF + YF - XF \cdot YF)$

(3) $\lambda X = (1 - (1 - XT)^{\lambda}, (XI)^{\lambda}, (XF)^{\lambda}), \lambda > 0$

(4) $(X)^{\lambda} = ((XT)^{\lambda}, (XI)^{\lambda}, 1 - (1 - XF)^{\lambda}), \lambda > 0$

Definition 6 see ([70]). Let $X = (XT, XI, XF)$ and $Y = (YT, YI, YF)$; then, the Hamming distance for $X = (XT, XI, XF)$ and V is as follows:

$$d(X, Y) = \frac{1}{3}(|XT - YT| + |XI - YI| + |XF - YF|). \quad (4)$$

3. SVNN Aggregation Operators

The SVNNWA and SVNNWG operators are defined.

Definition 7 see ([69]). Let C, the SVNNWA operator is as follows:

$$\begin{aligned} \mathrm{SVNNWA}_{z\omega}(XX_1, XX_2, \cdots, XX_n) &= \mathop{\oplus}_{j=1}^{n}(z\omega_j XA_j) \\ &= \left(1 - \prod_{j=1}^{n}(1 - XT_j)^{z\omega_j}, \prod_{j=1}^{n}(XI_j)^{z\omega_j}, \prod_{j=1}^{n}(XF_j)^{z\omega_j}\right), \end{aligned} \quad (5)$$

where $z\omega = (z\omega_1, z\omega_2, \ldots, z\omega_n)^T$ be the weight and $\sum_{j=1}^{n} z\omega_j = 1$.

Definition 8 see ([69]). Let $Y = (YT, YI, YF)$, the SVNNWG operator is as follows:

$$\begin{aligned} \mathrm{SVNNWG}_{z\omega}(XX_1, XX_2, \cdots, XX_n) &= \mathop{\otimes}_{j=1}^{n}(XA_j)^{z\omega_j} \\ &= \left(\prod_{j=1}^{n}(XT_j)^{z\omega_j}, 1 - \prod_{j=1}^{n}(1 - XI_j)^{z\omega_j}, \prod_{j=1}^{n}(1 - XI_j)^{z\omega_j}, 1 - \prod_{j=1}^{n}(1 - XF_j)^{z\omega_j}\right), \end{aligned} \quad (6)$$

where $z\omega = (z\omega_1, z\omega_2, \ldots, z\omega_n)^T$ is the weight and $\sum_{j=1}^{n} z\omega_j = 1$.

4. EDAS Method for MAGDM with SVNNs

The SVNN-EDAS is devised for MAGDM. Let $YY = \{YY_1, YY_2, \ldots, YY_m\}$ be alternatives. Let $ZZ = \{ZZ_1, ZZ_2, \ldots, ZZ_n\}$ be attributes and $wz = \{wz_1, wz_2, \ldots, wz_n\}$ be weight for ZZ_j, where $wz_j \in [0, 1], \sum_{j=1}^{n} wz_j = 1$. We assume $DD = \{DD_1, DD_2, \ldots, DD_l\}$ be invited DMs with weight for $dd = \{dd_1, dd_2, \ldots, dd_l\}$, where $dd_k \in [0, 1], \sum_{k=1}^{l} dd_k = 1$. And $YZ^{(k)} = (yz_{ij}^{k})_{m\times n} = (YT_{ij}^{k}, YI_{ij}^{k}, YF_{ij}^{k})_{m\times n}$ is the SVNN matrix. Subsequently, the designed calculating procedures are given.

Step 1: we produce the SVNN matrix $YZ^{(k)} = (yz_{ij}^{k})_{m\times n}$ for DMs and overall SVNN matrix $YZ = (yz_{ij})_{m\times n}$ by SVNNWG decision operator:

$$\begin{aligned} YZ^{(k)} &= \left[yz_{ij}^{k}\right]_{m\times n} = \begin{bmatrix} yz_{11}^{k} & yz_{12}^{k} & \cdots & yz_{1n}^{k} \\ yz_{21}^{k} & yz_{22}^{k} & \cdots & yz_{2n}^{k} \\ \vdots & \vdots & \vdots & \vdots \\ yz_{m1}^{k} & yz_{m2}^{k} & \cdots & yz_{mn}^{k} \end{bmatrix}, \\ YZ &= \left[yz_{ij}\right]_{m\times n} = \begin{bmatrix} yz_{11} & yz_{12} & \cdots & yz_{1n} \\ yz_{21} & yz_{22} & \cdots & yz_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ yz_{m1} & yz_{m2} & \cdots & yz_{mn} \end{bmatrix}, \\ yz_{ij} &= \left(YT_{ij}, YI_{ij}, YF_{ij}\right) \\ &= \left(\prod_{k=1}^{l}(YT_{ij}^{k})^{dd_k}, 1 - \prod_{k=1}^{l}(1 - YI_{ij}^{k})^{dd_k}, 1 - \prod_{k=1}^{l}(1 - YF_{ij}^{k})^{dd_k}\right). \end{aligned} \quad (7)$$

Step 2: we produce normalized $XYZ = [xyz_{ij}]_{m\times n}$ based on $YZ = (yz_{ij})_{m\times n}$:

$$xyz_{ij} = \left(XYT_{ij}, XYI_{ij}, XYF_{ij}\right) = \begin{cases} \left(YT_{ij}, YI_{ij}, YF_{ij}\right), Z_j \text{ is a benefit criterion,} \\ \left(YF_{ij}, YI_{ij}, YT_{ij}\right), ZZ_j \text{ is a cost criterion.} \end{cases} \tag{8}$$

Step 3: we produce the weight with CRITIC.

The CRITIC [68] is used to decide the weights. The calculating procedures are presented.

(1) The SVNN correlation coefficient values (SVNNCCV) for attributes are obtained:

$$\text{SVNNCCV}_{jt} = \frac{\sum_{i=1}^{m}\left(\theta\left(xyz_{ij}\right) - \theta\left(xyz_j\right)\right)\left(\theta\left(xyz_{it}\right) - \theta\left(xyz_t\right)\right)}{\sqrt{\sum_{i=1}^{m}\left(\theta\left(xyz_{ij}\right) - \theta\left(xyz_j\right)\right)^2}\sqrt{\sum_{i=1}^{m}\left(\theta\left(xyz_{it}\right) - \theta\left(xyz_t\right)\right)^2}}, j, t = 1, 2, \ldots, n, \tag{9}$$

where $(xyz_j) = (1/m)\sum_{i=1}^{m}(HV(nqq_{ij}) + 1)/2$, $\theta(xyz_t) = (1/m)\sum_{i=1}^{m}(HV(nqq_{it}) + 1)/2$, $\theta(xyz_{ij}) = (HV(nqq_{ij}) + 1)/2$, and $\theta(xyz_{it}) = (HV(nqq_{it}) + 1)/2$.

(2) produce the defined SVNN standard deviation values (SVNNSDV):

$$\text{SVNNSDV}_j = \sqrt{\frac{1}{m-1}\sum_{i=1}^{m}\left(\theta\left(xyz_{ij}\right) - \theta\left(xyz_j\right)\right)^2}, \tag{10}$$

where $\theta(xyz_j) = \frac{1}{m}\sum_{i=1}^{m}(HV(nqq_{ij}) + 1)/2$.

(3) produce the attributes' weight as follows:

$$wz_j = \frac{\text{SVNNSDV}_j \sum_{t=1}^{n}\left(1 - \text{SVNNCCV}_{jt}\right)}{\sum_{j=1}^{n}\left(\text{SVNNSDV}_j \sum_{t=1}^{n}\left(1 - \text{SVNNCCV}_{jt}\right)\right)}, \tag{11}$$

where $wz_j \in [0, 1]$ and $\sum_{j=1}^{n} wz_j = 1$.

Step 4: we produce the SVNN average solution (SVNNAS) for produced attributes:

$$\begin{aligned} \text{SVNNAS} &= \left[\text{SVNNAS}_j\right]_{1\times n} = \left[\frac{\sum_{i=1}^{m} nqq_{ij}}{m}\right]_{1\times n}, \\ \left[\text{SVNNAS}_j\right]_{1\times n} &= \left[\frac{\sum_{i=1}^{m} nqq_{ij}}{m}\right]_{1\times n} \\ &= \left(1 - \prod_{i=1}^{m}\left(1 - \text{NTT}_{ij}\right)^{\frac{1}{m}}, \prod_{i=1}^{m}\left(\text{NII}_{ij}\right)^{\frac{1}{m}}, \prod_{i=1}^{m}\left(\text{NFF}_{ij}\right)^{(1/m)}\right)_{1\times n}. \end{aligned} \tag{12}$$

Step 5: we produce the SVNN positive distance from average (SVNNPDA) and SVNN negative distance from average (SVNNNDA) as follows:

$$\begin{aligned} \text{SVNNPDA}_{ij} &= \left[\text{SVNNPDA}_{ij}\right]_{m\times n} = \frac{\max\left(0, \left(SV\left(\text{nqq}_{ij}\right) - SV\left(\text{SVNNAS}_j\right)\right)\right)}{SV\left(\text{SVNNAS}_j\right)}, \\ \text{SVNNNDA}_{ij} &= \left[\text{SVNNNDA}_{ij}\right]_{m\times n} = \frac{\max\left(0, \left(SV\left(\text{SVNNAS}_j\right) - SV\left(\text{nqq}_{ij}\right)\right)\right)}{SV\left(\text{SVNNAS}_j\right)}. \end{aligned} \tag{13}$$

Table 1: SVNN matrix by DD_1.

	ZZ_1	ZZ_2	ZZ_3	ZZ_4
YY_1	(0.34, 0.21, 0.44)	(0.42, 0.11, 0.48)	(0.24, 0.17, 0.44)	(0.43, 0.03, 0.44)
YY_2	(0.39, 0.12, 0.41)	(0.44, 0.23, 0.24)	(0.44, 0.09, 0.24)	(0.41, 0.05, 0.39)
YY_3	(0.40, 0.12, 0.40)	(0.33, 0.13, 0.44)	(0.34, 0.16, 0.44)	(0.28, 0.16, 0.42)
YY_4	(0.44, 0.15, 0.33)	(0.38, 0.32, 0.12)	(0.41, 0.07, 0.49)	(0.44, 0.12, 0.43)
YY_5	(0.24, 0.07, 0.44)	(0.42, 0.21, 0.28)	(0.42, 0.07, 0.48)	(0.42, 0.19, 0.38)

Step 6: we produce SVNNSP_i and SVNNSN_i:

$$\text{SVNNSP}_i = \sum_{j=1}^{n} zz_j \cdot \text{SVNNPDA}_{ij}, \text{SVNNNP}_i = \sum_{j=1}^{n} zz_j \cdot \text{SVNNNDA}_{ij}. \tag{14}$$

Step 7: we Normalized SVNNSP_i and SVNNSN_i:

$$\text{NSVNNSP}_i = \frac{\text{SVNNSP}_i}{\max_i (\text{SVNNSP}_i)}, \text{NSVNNSN}_i = 1 - \frac{\text{SVNNSN}_i}{\max_i (\text{SVNNSN}_i)}. \tag{15}$$

Step 8: we produce the SVNN appraisal values (SVNNAV) for each alternative:

$$\text{SVNNAV}_i = \frac{1}{2}(\text{NSVNNSP} + \text{NSVNNSN}_i). \tag{16}$$

Step 9: in terms of the SVNNAV, the higher decision value of SVNNAV is, the chosen optimal choice is.

5. Practical Example and Comparative Analysis

5.1. Practical Example. Teaching quality is the eternal topic of curriculum construction and reform in universities in my country. With the knowledge economy development, the real-life intensification of international competition for teaching resources, and the continuous expansion of the university of higher education in my country, all aspects of society have put forward the corresponding requirements for higher education quality. Since 2010, according to the deployment of the central government, the state has taken teaching quality improvement as the important focus of higher education development while reasonably grasping the rhythm of higher education development and stabilizing the scale of enrollment. At present and in the future, my country's universities are shouldering the important task of building a strong country among human resources, further promoting the education priority development, focusing on grasping the laws of educational development, innovating educational development concepts, changing educational development methods, solving educational development problems, and continuously improving my country's higher education development. At present, the central government and various local departments are actively promoting the teaching management reform in universities. Based on the teaching reform, the overall level of higher education is promoted through teaching quality management. Many colleges and universities use this to carry out a series of tasks such as teaching objective management, quality supervision mechanisms, and teaching supervision and evaluation, all of which have a positive effect on ensuring teaching quality. As the development trend of higher education changes from scale development to quality improvement, the existing teaching quality supervision and management decision methods can no longer fully meet the current teaching quality improvement needs. New concepts and new methods of modern quality management should be gradually introduced. The teaching quality monitoring system comprehensively establishes a human-oriented, scientific, and institutionalized long-term management mechanism. The PE teaching quality evaluation is MAGDM. In this defined section, the PE teaching quality evaluation is provided with SVNN-EDAS. There are five PE teachers $YY_i\,(i = 1, 2, 3, 4, 5)$. In order to choose the best PE teacher in colleges and universities, the universities invite three experts $\text{DD} = \{DD_1, DD_2, DD_3\}$, whose weight $dd = (0.30, 0.40, 0.30)$ is used to assess the PE teachers in colleges and universities. All invited education experts depict their assessment with four defined attributes: ① ZZ_1 is teaching effect; ② ZZ_2 is the cost of teaching resources; ③ ZZ_3 is student satisfaction; ④ ZZ_4 is peer expert teacher evaluation. Evidently, ZZ_2 is the cost attribute. To obtain the optimal PE teacher in colleges and universities, the defined procedures are given in.

Step 1: building the SVNN-matrix $YZ^{(k)} = (yz_{ij}^{k})_{5\times 4}$ as in Tables 1–3 with questionnaire and mathematical statistical methods, the overall SVNN matrix is calculated in Table 4

Step 2: we normalize $YZ^{(k)} = (yz_{ij}^{k})_{5\times 4}$ into $\text{XYZ} = [xyz_{ij}]_{5\times 4}$ (see Table 5)

Step 3: we produce the weights by CRITIC (Table 6)

Table 2: SVNN matrix by DD_2.

	ZZ_1	ZZ_2	ZZ_3	ZZ_4
YY_1	(0.33, 0.41, 0.33)	(0.34, 0.11, 0.38)	(0.43, 0.17, 0.33)	(0.33, 0.03, 0.33)
YY_2	(0.39, 0.14, 0.31)	(0.34, 0.13, 0.43)	(0.33, 0.09, 0.43)	(0.31, 0.05, 0.39)
YY_3	(0.30, 0.14, 0.30)	(0.32, 0.13, 0.37)	(0.33, 0.15, 0.33)	(0.48, 0.15, 0.34)
YY_4	(0.33, 0.15, 0.33)	(0.38, 0.34, 0.14)	(0.31, 0.07, 0.39)	(0.33, 0.14, 0.33)
YY_5	(0.43, 0.07, 0.33)	(0.34, 0.41, 0.48)	(0.34, 0.07, 0.38)	(0.34, 0.19, 0.38)

Table 3: SVNN matrix by DD_3.

	ZZ_1	ZZ_2	ZZ_3	ZZ_4
YY_1	(0.22, 0.41, 0.22)	(0.24, 0.11, 0.28)	(0.42, 0.17, 0.22)	(0.22, 0.02, 0.22)
YY_2	(0.29, 0.14, 0.21)	(0.22, 0.42, 0.43)	(0.22, 0.09, 0.42)	(0.21, 0.05, 0.29)
YY_3	(0.20, 0.14, 0.20)	(0.22, 0.12, 0.26)	(0.22, 0.15, 0.22)	(0.48, 0.15, 0.24)
YY_4	(0.22, 0.15, 0.22)	(0.28, 0.24, 0.14)	(0.21, 0.07, 0.29)	(0.22, 0.14, 0.22)
YY_5	(0.42, 0.07, 0.22)	(0.24, 0.41, 0.48)	(0.24, 0.07, 0.28)	(0.24, 0.19, 0.28)

Table 4: Overall SVNN evaluation information.

	ZZ_1	ZZ_2	ZZ_3	ZZ_4
YY_1	(0.4944, 0.004, 0.4244)	(0.3942, 0.1254, 0.4246)	(0.2681, 0.1243, 0.5016)	(0.3353, 0.2145, 0.5625)
YY_2	(0.4346, 0.1008, 0.3644)	(0.4432, 0.18907, 0.3366)	(0.6300, 0.3214, 0.3500)	(0.5601, 0.3498, 0.3066)
YY_3	(0.4324, 0.2122, 0.2696)	(0.4030, 0.1067, 0.2990)	(0.3268, 0.4326, 0.5502)	(0.3361, 0.4209, 0.5636)
YY_4	(0.4234, 0.2198, 0.3264)	(0.3606, 0.2109, 0.4192)	(0.5665, 0.3287, 0.3333)	(0.2613, 0.2199, 0.5085)
YY_5	(0.3166, 0.1078, 0.4632)	(0.4923, 0.3217, 0.4099)	(0.3532, 0.4367, 0.5268)	(0.3355, 0.2165, 0.5523)

Table 5: The normalized SVNN matrix.

	ZZ_1	ZZ_2	ZZ_3	ZZ_4
YY_1	(0.4944, 0.004, 0.4244)	(0.4246, 0.1254, 0.3942)	(0.2681, 0.1243, 0.5016)	(0.3353, 0.2145, 0.5625)
YY_2	(0.4346, 0.1008, 0.3644)	(0.3366, 0.18907, 0.4432)	(0.6300, 0.3214, 0.3500)	(0.5601, 0.3498, 0.3066)
YY_3	(0.4324, 0.2122, 0.2696)	(0.2990, 0.1067, 0.4030)	(0.3268, 0.4326, 0.5502)	(0.3361, 0.4209, 0.5636)
YY_4	(0.4234, 0.2198, 0.3264)	(0.4192, 0.2109, 0.3606)	(0.5665, 0.3287, 0.3333)	(0.2613, 0.2199, 0.5085)
YY_5	(0.3166, 0.1078, 0.4632)	(0.4099, 0.3217, 0.4923)	(0.3532, 0.4367, 0.5268)	(0.3355, 0.2165, 0.5523)

Table 6: The obtained weight.

	ZZ_1	ZZ_2	ZZ_3	ZZ_4
Weight	0.1313	0.3334	0.3198	0.2155

Table 7: The SVNNAS.

	SVNNAS
ZZ_1	(0.4373, 0.8484, 0.1747)
ZZ_2	(0.5748, 0.4304, 0.4143)
ZZ_3	(0.4673, 0.4343, 0.4170)
ZZ_4	(0.4110, 0.3744, 0.3448)

Step 4: we produce the SVNNAS (Table 7)

Step 5: we produce the SVNNPDA and SVNNNDA (see Tables 8 and 9)

Step 6: we produce the SVNNSP and SVNNSN (see Table 10)

Step 7: we produce the NSVNNSP and NSVNNSN as in Table 11

Step 8: we produce the SVNNAV (See Table 12)

Step 9: relying on the SVNNAV, the order is $YY_5 > YY_2 > YY_4 > YY_3 > YY_1$ and YY_5 is the best choice

5.2. Compared Analysis. The SVNN-EDAS is compared with given SVNNWA and SVNNWG [69]. For SVNNWA, the result is $SV(YY_1) = 0.4109$, $SV(YY_2) = 0.5679$, $SV(YY_3) = 0.4672$, $SV(YY_4) = 0.4972$, and $SV(YY_5) = 0.7632$. The order is $YY_5 > YY_2 > YY_4 > YY_3 > YY_1$. For the SVNNWG operator, the result is $SV(YY_1) = 0.4096$, $SV(YY_2) = 0.5963$, $SV(YY_3) = 0.4452$, $SV(YY_4) = 0.4968$, and $S(Y_5) = 0.6645$. The order is $YY_5 > YY_2 > YY_4 > YY_3 > YY_1$.

The SVNN-EDAS is compared with SVNN-VIKOR [71]. The SVNN closest ideal values are as follows: $\text{SVNNCIV}(YY_1) = 1.0000$, $\text{SVNNCIV}(YY_2) = 0.1789$, $\text{SVNNCIV}(YY_3) = 0.3276$, $\text{SVNNCIV}(YY_4) = 0.6043$, and $\text{SVNNCIV}(YY_5) = 0.3769$. And the SVNN worst score values are as follows: $\text{SVNNWSV}(YY_1) = 0.0000$, $\text{SVNNWSV}(YY_2) = 0.5023$, $\text{SVNNWSV}(YY_3) = 0.6577$, $\text{SVNNWSV}(YY_4) = 0.1974$, and $\text{SVNNWSV}(YY_5)$

Table 8: The SVNNPDA.

	ZZ_1	ZZ_2	ZZ_3	ZZ_4
YY_1	0.0000	0.0000	0.0000	0.3249
YY_2	0.3083	0.0000	0.2929	0.0000
YY_3	0.0000	0.0000	0.0000	0.0000
YY_4	0.0000	0.0000	0.0000	0.0215
YY_5	0.3806	0.4750	0.3852	0.0000

Table 9: The SVNNNDA.

	ZZ_1	ZZ_2	ZZ_3	ZZ_4
YY_1	0.0000	0.3607	0.0000	0.0063
YY_2	0.0374	0.0053	0.1368	0.0375
YY_3	0.3943	0.0358	0.00874	0.0000
YY_4	0.0000	0.0000	0.0000	0.1465
YY_5	0.1385	0.0394	0.0982	0.0000

Table 10: The SVNNSP and SVNNSN.

	SVNNSP	SVNNSN
YY_1	0.0700	0.1216
YY_2	0.1341	0.0585
YY_3	0.0000	0.0665
YY_4	0.0046	0.0316
YY_5	0.3315	0.0627

Table 11: The NSVNNSP and NSVNNSN.

	NSVNNSP	NSVNNSN
YY_1	0.2112	0.0000
YY_2	0.4046	0.5189
YY_3	0.0000	0.4532
YY_4	0.0140	0.7404
YY_5	1.0000	0.4842

Table 12: The SVNNAV.

	SVNNAV	Order
YY_1	0.1056	5
YY_2	0.4618	2
YY_3	0.2266	4
YY_4	0.3772	3
YY_5	0.7421	1

Table 13: The obtained results.

Models	Order	The optimal choice	The worst choice
SVNNWA [69]	$YY_5 > YY_2 > YY_4 > YY_3 > YY_1$	YY_5	YY_1
SVNNWG [69]	$YY_5 > YY_2 > YY_4 > YY_3 > YY_1$	YY_5	YY_1
SVNN-VIKOR [71]	$YY_5 > YY_2 > YY_4 > YY_3 > YY_1$	YY_5	YY_1
Existing SVNN-EDAS [72]	$YY_5 > YY_2 > YY_3 > YY_4 > YY_1$	YY_5	YY_1
SVNN-EDAS	$YY_5 > YY_2 > YY_4 > YY_3 > YY_1$	YY_5	YY_1

= 0.1054. Then, SVNN relative closeness are as follows: $\text{SVNNRC}(YY_1) = 1.0000$, $\text{SVNNRC}(YY_2) = 0.3735$, $\text{SVNNRC}(YY_3) = 0.6354$, $\text{SVNNRC}(YY_4) = 0.5659$, and $\text{SVNNRC}(YY_5) = 0.2922$. The order is $YY_5 > YY_2 > YY_4 > YY_3 > YY_1$.

The SVNN-EDAS is compared with existing SVNN-EDAS [72]. The appraisal scores are as follows: $AS(YY_1) = 0.3281$, $AS(YY_2) = 0.6614$, $\text{SVNNGRD}(YY_3) = 0.4109$, $AS(YY_4) = 0.5472$, and $AS(YY_5) = 0.7893$. The order is $YY_5 > YY_2 > YY_3 > YY_4 > YY_1$.

Eventually, the obtained results are shown in Table 13.

Obtained from defined Table 13, it is very evident that the obtained best choice is YY_5; however, the worst choice is YY_1. The defined different methods can tackle the MAGDM from different perspectives. At the same time, the differences between the built SVNN-EDAS method and the existing SVNN-EDAS method [72] are as follows: the weight is derived by the CRITIC method (see Step 3); the SVNNAS is produced (see Step 4); the SVNNPDA and SVNNNDA are produced (see Step 5); the SVNNSP_i and SVNNSN_i are produced based on the corresponding weighted sum of the SVNNPDA and SVNNNDA (Step 6).

These five decision models have their decision advantages: (1) the SVNNWA considers group influences; (2) the SVNNWG considers individual influences; (3) SVNN-VIKOR emphasis the distance and positive ideal points. It is shown that the SVNN-EDAS method emphasizes the expectation value from the SVNN average alternative. Compared with the different decision methods mentioned, the SVNN-EDAS method is more practical and efficient because the calculation steps are simpler and easier to apply in practice.

6. Conclusion

In today's society, which pays special attention to quality education and talent training, school sports, as an important section of university higher education, is always closely related to the quality of talents. At the first national school sports work conference held in Beijing since the foundation of the People's Republic of China, Comrade Chen Zhili, State Councilor, proposed that "school sports work should be regarded as an important breakthrough and main work aspect to comprehensively promote quality education." At present, colleges and universities can earnestly understand the spirit of the meeting, realize the importance and urgency of strengthening school PE work from a strategic height, continuously increase the reform of PE teaching, and make breakthroughs in PE teaching mode, content, and method. At the same time, in order to effectively ensure the quality development, quality of university higher education, and development process of teaching quality education, more and more decision attention has been always paid to the PE teaching quality. However, since the PE teaching quality monitoring system is a dynamic and developing process, there will never be a permanent and effective model for this research. Therefore, with the continuous deepening of PE teaching quality reform, it is necessary to adapt to the corresponding needs of education and society with changes and innovations. In order to effectively improve PE teaching quality evaluation, we should continuously improve the PE quality monitoring. The PE teaching quality evaluation is MAGDM. In this article, the SVNN-EDAS is devised for a defined MAGDM. The weights are decided with the CRITIC method. Then, a novel SVNN-EDAS is built for MAGDM and the calculating steps are listed. Eventually, the PE teaching quality evaluation has been well given to show the superiority. Therefore, the main advantages of this work are outlined: (1) CRITIC is defined to produce the attribute's weight; (2) the EDAS method is defined under SVNNs; (3) a decision example for PE teaching quality evaluation is demonstrated using the SVNN-EDAS and some comparative decisions were used to show the SVNN-EDAS. Therefore, the main limitations of this work are outlined: the incomplete weight information is not considered in this article.

Research methods will be continued in our future works based on existing research in this field. (1) Consensus issues should be analyzed in group decision-making [73–79] for PE teaching quality evaluation. (2) The methods built are improved to consider the Fermatean fuzzy sets [80–85], which are also the research topics worthy of future study direction.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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