

The Service Leadership Knowledge Scale: Norms and psychological correlates

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Abstract

Guided by the Service Leadership Theory, substantial effort has been devoted to service leadership education in Hong Kong. In contrast, scientific instruments that assess the basic concepts of service leadership are non-existent. As such, we developed three scales pertinent to the notion of service leadership, including knowledge, attitude, and behavior scales. The present study reported the development of norms and psychological correlates of the Service Leadership Knowledge Scale consisting of 40 multiple-choice questions (i.e., SLK-SF-40). Based on a large and representative sample (N = 4,486) of university students recruited from the eight University Grants Committee (UGC)-funded universities in Hong Kong, the results showed that the female students had a significant higher level of service leadership knowledge than did the male students, resulting in the separate norms for the two groups. While age did not show significant influence on the students' knowledge score, the students' grade point average (GPA), leadership training experience, and experience of taking leadership roles in university organizations were all positively associated with their service leadership knowledge scores, but the effect size was small. The percentile norms of this knowledge scale developed in this study provides a useful tool for designing, implementing, and evaluating service leadership education programs.

Keywords: Service leadership, leadership education, program evaluation, percentile norms, objective knowledge

Introduction

With the growing globalization and rapid technology development which have intensified international economic competition, skilled human capital is deemed vital to sustain a nation's competitiveness and long-term prosperity (1, 2). Regarding the list of desirable attributes, leadership is among the most frequently cited ones. As Ewing, Bruce and Ricketts (3) stated, "the future success of local communities,

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states, and the country is tied to the development of quality leaders” (p. 119).

The increasing need for leadership qualities comes with a great emphasis on leadership education. In particular, higher education institutions have incorporated leadership into their mission statements and included leadership as one of the important student learning outcomes (4-6). To cultivate leadership qualities among the university students, a vast number of leadership programs in different forms (e.g., curriculum, course, workshop and outdoor training) have been offered to them (7-9). For instance, with the financial support of the Victor and William Fung Foundation, a large-scale leadership project was launched in eight public universities funded by the University Grants Committee (UGC) in Hong Kong to satisfy the needs of predominant service economy by nurturing “service leaders” (10).

Despite the divergent patterns, common themes of learning goals can be identified for these leadership programs, such as improving leadership knowledge and nurturing a diverse range of leadership attributes (11,12). From the perspective of evidence-based practice (13), it is essential to carry out systematic evaluation studies to examine whether these intended learning outcomes are achieved and whether the related leadership education is effective. Unfortunately, rigorously designed evaluation research for leadership education is scarce, particularly in the Chinese culture. One possible reason has to do with the severe lack of valid tools to assess Chinese people’s leadership attributes in the dimensions of leadership knowledge, attitudes and behavior.

Service leadership education and evaluation in Hong Kong

With specific reference to Hong Kong, the economic structure has shifted from the manufacturing economy to the service economy which calls for leaders with service mindset (14). To facilitate leadership education in the service era, Chung (15) proposed the Service Leadership Theory which defines service leadership as to “satisfy needs by consistently providing quality personal service to everyone one

comes into contact with, including one’s self, others, groups, communities, systems, and environments” (p. 5). To elaborate, service leadership highlights service orientation and manifest itself in three realms— self, others, and systems (15,16). Furthermore, it is believed that effective service leadership is determined by three key elements: leadership competency including intra- and inter-personal competencies, moral character, and caring disposition (15).

Guided by the Service Leadership Theory and with the financial support of the Victor and William Fung Foundation, the eight UGC-funded universities in Hong Kong have designed and implemented their own service leadership programs, which incorporate knowledge and beliefs of service leadership and aim to nurture critical service leadership qualities (i.e., leadership competency, caring disposition, and moral character) in the university students (10). For instance, at The Hong Kong Polytechnic University (PolyU), both credit-bearing service leadership subjects embedded in the general education curriculum and the non-credit bearing programs have been offered to the students since the 2012/2013 academic year (17). In addition, PolyU and other universities in mainland China jointly organized several intensive service leadership training programs for their students. While evaluation findings have consistently shown that the participants were highly satisfied with these service leadership education programs and they showed improvements in self-perceived service leadership attributes (18-20), the participants’ actual gain in service leadership knowledge remains unknown.

Evaluation on knowledge gain and Service Leadership Knowledge Scale

Acquisition and application of leadership knowledge is among desirable outcomes of leadership education (12,17). This learning outcome can be regarded as the foundation of service leadership education, which endeavors to promote a new leadership philosophy. To illustrate, without mastering service leadership knowledge, for example, what does service leadership emphasize and what qualities an effective service leader should develop, it is

quite difficult, if not impossible, for the participants to adapt for the leadership beliefs and optimize their leadership practice. In this sense, it is indispensable to evaluate the participants' knowledge gained through a service leadership program in order to portray a complete picture of the program's effectiveness.

In leadership education, it is not uncommon to examine what the participants have learnt from the program. However, due to the dearth of validated leadership knowledge scales, most studies examined self-perceived knowledge instead of objectively assessed knowledge. For instance, in an evaluation study conducted by Stedman, Rutherford, Rosser, and Elbert (21), the participants were asked to evaluate their own capacity in defining authentic leadership, character, relationship building stages, and other related knowledge points after a 5-day leadership conference. While measuring self-perceived knowledge seems to have advantages (e.g., easy and efficient), this approach has potential shortcomings. For example, the participants may overestimate their own knowledge level due to social desirability bias (22). Besides, the trainees' self-ratings are likely to be affected by their subjective experience in the training. As argued by Sitzmann, Ely, Brown, and Bauer (23), "self-assessed knowledge is generally more useful as an indicator of how learners feel about a course than as an indicator of how much they learned from it" (p. 180).

Concerning these potential issues of measuring subjective leadership knowledge, it can be argued that a validated objective knowledge scale is a prerequisite for rigorously assessing the participants' improvement of knowledge in a leadership program. Unfortunately, such objective leadership knowledge assessment tools are virtually non-existent in the Chinese communities. To fill this research gap as well as facilitating the evaluation of service leadership education in Hong Kong, we have developed a 200-item long-form Service Leadership Knowledge Scale (SLK-LF-200), which is able to assess individuals' actual understanding of service leadership. The scale primarily covered the knowledge points of the aforementioned Service Leadership Theory and associated publications of Chung, Shek and collaborators (e.g., 24,25). The details of the content of the SLK-LF-200 have been reported elsewhere (26).

The SLK-LF-200's content-validity and criterion-related validity were found to be good (26,27). More specifically, the criterion-related validation study compared an experimental group (i.e., 67 students who took the "Service Leadership" subject at PolyU) with a control group (i.e., 94 students who had never received any service leadership education) regarding their scores on the SLK-LF-200. In the study, 63 out of the initial 200 items were identified as being able to significantly differentiate the two groups (27). A further item screening procedure was conducted and another 13 items were discarded concerning face validity or item duplication issues. As a result, a 50-item short-form Service Leadership Knowledge Scale (SLK-SF-50) was formed, constituting a fundamental assessment tool for evaluating service leadership education.

Norms and correlates of the Knowledge Scale

While the content validity and criteria-related validity of the long-form Service Leadership Knowledge Scale (i.e., SLK-LF-200) have been supported, psychometric properties such as convergent and divergent validity of the 50-item scale (i.e., SLK-SF-50) are unknown. Besides, the norms as well as the potential correlates of the knowledge scale are also important issues to be considered. As such, the eight UGC-funded universities in Hong Kong jointly organized a large-scale online survey to validate and finalize the service leadership assessment tools including the knowledge scale. Using the SLK-SF-50, the validation study yielded a final version of the Service Leadership Knowledge Scale which consists of 40 items (i.e., SLK-SF-40). While the procedure of obtaining the SLK-SF-40 as well as the scale's convergent and construct validity is reported in another article of this issue, the norms and the possible psychological correlates of university students' scores on SLK-SF-40 are the foci of the current paper.

The norms of the service leadership knowledge are important because they serve as a benchmark to assist educators and researchers in developing, implementing, and evaluating effective service leadership programs for the purpose of helping students become knowledgeable service leaders. First, the

established norms can be used to identify the standing of the target group's knowledge level in the normative population, based on which training needs can be determined and tailored training programs can be designed. Second, with the norms, participants' progress during training can be monitored by examining changes of their rank in the normative population. Likewise, the norms can be applied to evaluate the training effectiveness.

Normative data can be presented in terms of means and standard deviations of raw score (28). In using this type of normative data, one's standing on the assessment can be estimated through using a standardized score (i.e., *z* score), which can be further referred to a table of areas under the normal curve. While this method assumes normative data to be normally distributed, the reality is that normative data will often depart significantly from a normal distribution. Under this circumstance, an alternative, maybe a better choice is percentile norms, which may consist of a full presentation of the percentile rank for each raw score, or it may simply present some of the raw scores corresponding to several landmark percentiles (e.g., the 1st, 5th, 10th, 50th percentile etc.). Various examples of the use of percentile norms can be found in the extant literature (29-31).

Apart from its usefulness when normative data are not normally distributed, a further advantage of percentile norms is simplicity. While a standardized score needs to be interpreted by mapping it on to percentile rank through a look-up table developed by the researcher or an external conversion table (28), the percentile norms can tell us directly the relative position of an individual's test score in the normative population. Percentile norms is easy to understand even for lay people, as the meaning of percentiles is apparently unequivocal (32). In view of the above positive features of percentile norms, the current study utilized this method to develop norms for the Service Leadership Knowledge Scale using university students in Hong Kong as the normative population.

To determine whether there is a need to develop separate norms for sub-groups, the present study considered two demographic characteristics: gender and age. For gender, in the previous studies, women were found to be more cooperative, relational, empathetic and caring as compared with men (33-37). Possessing these characteristics which are related to

service leadership qualities, women may be more aware of the demands of service leaders in today's service economy and have a better understanding of the philosophy and concepts of service leadership. Therefore, we expected that female students would have a higher level of service leadership knowledge as compared to male students (Hypothesis 1). For the influence of age, very little evidence can be identified in the existing literature. Besides, for the target population (i.e., university students) in the present study, variability in age is generally very small. Thus, we did not expect significant influence of age on the participants' service leadership knowledge score.

The current study also considered the participants' academic achievement indexed by grade point average (i.e., GPA), experience of receiving leadership training and experience of being a leader as another three potential correlates of service leadership knowledge score. A high GPA generally indicates an individual's success in course assignments thus could in part represent one's cognitive ability (38). Based on the prior studies which consistently showed a positive relationship between leadership and intelligence observers including GPA (38,39), we expected a positive association between GPA and service leadership knowledge (Hypothesis 2).

Although leadership training received by university students may not be directly related to the notion of service leadership, some overlapped knowledge points might be covered, such as the required leadership competency (e.g., problem-solving and emotional competence). As a result, it is quite reasonable to expect that one's leadership training experience, regardless of its form and content, will be positively associated with one's service leadership knowledge score (Hypothesis 3). For student leadership experience, we argue that being a leader in a student organization will allow a student to understand what is demanded by such a position and how he or she can better serve other students. Indeed, previous research found that years of being in a leadership role increased a leader's servant leader behaviors such as altruistic and empathetic behaviors (35). As such, we hypothesized that experience of being a leader would positively correlate with service leadership knowledge score as well (Hypothesis 4).

The present study

In March 2017, an online-survey project was initiated in the eight UGC-funded institutions in Hong Kong to validate measures assessing the qualities of service leaders as outlined by the Service Leadership Theory. The eight universities include The Hong Kong Polytechnic University (PolyU), The Chinese University of Hong Kong, The Education University of Hong Kong, Hong Kong Baptist University, City University of Hong Kong, Lingnan University, The University of Hong Kong, and Hong Kong University of Science and Technology. Ethics approval for the validation study was obtained from the Human Subjects Ethics Sub-committee of PolyU, which served as the lead institution of the project. The project aimed at validating three scales including knowledge, attitude, and behavior scales, among which the knowledge scale was the focus of the present study. Specifically, the present study outlined the norms and psychological correlates of the final version of the Service Leadership Knowledge Scale (i.e., SLK-SF-40).

Methods

The online survey was launched simultaneously in eight higher education institutions in Hong Kong.

While the research team at PolyU prepared the questionnaire and set up the online survey, each participating university recruited their undergraduate students as participants by distributing the link of the online survey. The participants were well informed of the principles of voluntary, anonymity, and freedom to withdraw from the study at any time. The students' consent was sought and each was given a supermarket voucher of 100 Hong Kong dollars as a token of appreciation upon completion of the survey.

The data collection lasted for approximately four months from March to June in 2017. Cases having at least one of the following issues were excluded from further analyses: 1) the participants did not provide consent as indicated by their selection of the option "I decline" on the consent form page, 2) the case was identified as repeated completion due to its same student ID as that of another case, and 3) the participants who claimed to be postgraduate students by themselves. After removing these invalid cases ($n = 69$), the final sample consisted of 4,486 participants, among whom 1,517 (33.82%) were male and 2,969 (66.18%) were female. The participating students' age range was between 15 to 34 years ($M = 20.47$, $SD = 1.67$), with 1,344 (29.96%) aged between 15 to 19 years and 3,142 (70.04%) aged 20 years or above. Table 1 summarizes the demographic characteristics of the participants in each university based on age and gender.

Table 1. Demographic characteristics of the sample

University	1	2	3	4	5	6	7	8	Total
No. of participants	1,000	505	500	517	464	500	500	500	4,486
Percentage	22.29%	11.26%	11.15%	11.52%	10.34%	11.15%	11.15%	11.15%	100%
Age range	18-27	17-29	17-34	15-28	18-34	18-29	17-28	16-28	15-34
Age (Mean/SD)	20.46/ 1.65	20.08/ 1.55	21.05/ 1.75	20.79/ 1.67	20.63/ 1.77	20.54/ 1.55	20.38/ 1.67	19.85/ 1.50	20.47/ 1.67
Age group (15-19) (n/%)	297/ 29.70	193/ 38.22	95/ 19.00	117/ 22.63	112/ 24.14	133/ 26.60	173/ 34.60	224/ 44.80	1,344/ 29.96
Age group (≥ 20) (n/%)	703/ 70.30	312/ 61.78	405/ 81.00	400/ 77.37	352/ 75.86	367/ 73.40	327/ 65.40	276/ 55.2	3,142/ 70.04
Male students (n/%)	409/ 40.90	130/ 25.74	98/ 19.60	122/ 23.60	128/ 27.59	148/ 29.60	151/ 30.20	331/ 66.20	1,517/ 33.82
Female students (n/%)	591/ 59.10	375/ 74.26	402/ 80.40	395/ 76.40	336/ 72.41	352/ 70.40	349/ 69.80	169/ 33.80	2,969/ 66.18

Measures

The validation project included a wide array of measurements including the three service leadership scales, external criterion scales such as Moral Self Concept, demographic measures, and potential correlates. The present study focused on the Service Leadership Knowledge Scale, and its demographic and other potential correlates.

Service Leadership Knowledge Scale

The knowledge scale (i.e., SLK-SF-50) administered in the present project consisted of 50 multiple-choice questions generated based on the Service Leadership Theory proposed by Chung (15). The scale had a holistic coverage of the service leadership knowledge points pertaining to different domains such as the general description and the three realms of service leadership, service leadership competency, moral character, caring disposition, the core belief “everyone can be a leader,” and so on. Detail description of each knowledge domain has been reported elsewhere (26).

In the present study, 10 items in the SLK-SF-50 were discarded due to their low item-total correlations (i.e., below .30; see another paper in this special issue). The retained 40 items formed the final scale (i.e., SLK-SF-40) which covered the same knowledge domains as did the original scale. The final scale possessed a one-factor structure with good overall goodness-of-fit indices (e.g., $\chi^2_{(740)} = 3,492.44$, $p < .001$; CFI = .98; TLI = .99; RMSEA = .03). The validation procedure and related validation indicators of the SLK-SF-40 are reported in another article in this issue. The present study was based on the final 40-item scale, which showed good internal reliability (i.e., Cronbach Alpha = .94). Each participant's answer on each item was coded as “1” or “0” to indicate a correct or incorrect answer, respectively. A total score across the 40 items was computed as the service leadership knowledge score for each participant. In the present study, the participants' knowledge score ranged from 2 to 40 ($M = 22.55$, $SD = 10.46$).

Demographic and other potential correlates

The demographic characteristics concerned in the present study included age and gender. Other potential correlates included grade point average (i.e., GPA), experience of leadership training and experience of being in a leadership role.

For GPA, while four participating universities adopted a system with 4.00 as the maximum score, other three universities had different maximum GPA scores (e.g., 4.5). Thus, for participants coming from these three universities, their raw GPA scores were converted to new scores using the formula: new GPA score = raw GPA score \times 4/the maximum GPA score in the university. After this adjustment, the participants' GPA ranged between 0 and 4 ($M = 2.89$, $SD = .45$).

Furthermore, the participants reported whether they had ever taken any leadership course or training including that related to service leadership (0 = No, 1 = Yes), and whether they had served in any leadership position in an organization such as student association (0 = No, 1 = Yes).

Data analyses

First, a multiple regression analysis was performed to examine whether gender (1 = Male, 2 = Female) and age significantly influenced participants' knowledge score. The results were used to decide whether there was a need to create separate norms for sub-groups. For example, if male students' knowledge scores significantly differ from that of their female counterparts, norms will be constructed separately for male and female students.

Second, we run normality tests to see whether knowledge scores are normally distributed. If the data are normally distributed, we will calculate standardized scores as well as percentile norms, and percentiles will be constructed only if the data are not normally distributed.

When constructing percentile norms, we first mapped raw scores to each percentile from 1 to 100. As several students gained the same knowledge score, one raw score can have several percentile rank scores, which may cause difficulties in interpreting the norms. Therefore, we further calculated a unique

percentile for each raw score. As strongly recommend by Crawford et al. (28), we defined the unique percentile of raw scores as the percentage including those fall below as well as half of those obtaining the score of interest. This calculation method can be presented by the formula below:

$$\text{Percentile rank of a given raw score} = 100 \times (m + 0.5k)/N,$$

where m means the number of participants scoring below the given raw score, k is the number of participants obtaining the given score, and N represents the overall size of the normative sample considered. This method is adopted as it takes the discrepancy between a test score and the real valued score into account (28). After this calculation procedure, we further rounded off the figures to present the integer values.

Third, correlational analyses were utilized in order to investigate of associations that existed between other potential correlates (e.g., GPA and leadership training experience) and the participants' knowledge score.

Results

While age did not show significant predicting effect on the knowledge score ($\beta = -.0003$, $p = .99$), gender significantly predicted the participants' knowledge score ($\beta = .17$, $p < .001$; Cohen's $f^2 = .03$), with female students ($M = 23.85$, $SD = 10.10$) having significantly higher knowledge scores than male students ($M = 20.02$, $SD = 10.70$). Thus, Hypothesis 1 was supported.

Then we performed normality tests for female and male groups separately. A Shapiro-Wilk's test ($p < .001$) (40,41) showed that the knowledge scores were not normally distributed for both males and females, with a skewness of .22 (SE = .06, z-value = 3.67, $p < .001$) and a kurtosis of -1.43 (SE = .13, z-value = -11, $p < .001$) for the male participants, and a skewness of -.30 (SE = .04, z-value = -7.5, $p < .001$) and a kurtosis of -1.31 (SE = .09, z-value = -14.56, $p < .001$) for the female group (42-

44). A further visual inspection of their histograms revealed a bimodal distribution for both groups. As such, only percentile norms were built separately for both male and female students (see Table 2 and Table 3).

Correlates of knowledge score

The results of correlational analysis showed that the participants' service leadership scores were significantly correlated with their GPA ($r = .20$, $p < .001$; $r^2 = .04$), experience of taking leadership course or training ($r = .07$, $p < .001$; $r^2 = .005$), and experience of being a leader ($r = .12$, $p < .001$; $r^2 = .014$), meaning that students with higher GPA, having experience of taking leadership course or training, or having experience of being a leader before were likely to have a better understanding of service leadership knowledge. Hence, Hypotheses 2 to 4 were also supported. However, it is noteworthy that the effect size involved was small.

Discussion

The present study outlined percentile norms and potential psychological correlates of the Service Leadership Knowledge Scale (SLK-SF-40). As a pioneering attempt to develop and validate objective knowledge scale pertinent to service leadership, the present study is a timely response to the lack of assessment tools measuring individuals' leadership knowledge in the Chinese context. Concerning the fact that substantial effort has been taken on promoting service leadership education in Hong Kong while little research has articulated the effectiveness, the present study also makes an important progress in addressing the issue of evaluation. In particular, the established norms will serve as a useful instrument not only to assess individuals' standing in a normative population regarding the fundamental knowledge of service leadership, but also to track the improvement of the participants' relative standing during and after receiving service leadership education.

Table 2. Percentiles and related raw scores for Service Leadership Knowledge Scale (SLK-SF-40) by gender

Percentile (1-50)	Raw Score			Percentile (51-99)	Raw Score		
	Male (N = 1,517)	Female (N = 2,969)	Total Sample (N = 4,486)		Male (N = 1,517)	Female (N = 2,969)	Total Sample (N = 4,486)
1	≤ 4.00	≤ 5.00	≤ 5.00	51	18.00	27.00	24.00
2	5.00	6.00	6.00	52	19.00	27.00	25.00
3	6.00	7.00	6.00	53	19.00	27.00	25.00
4	6.00	7.00	6.00	54	20.00	28.00	26.00
5	6.00	7.00	7.00	55	20.00	28.00	26.00
6	6.00	8.00	7.00	56	21.00	28.00	27.00
7	7.00	8.00	7.00	57	22.00	29.00	27.00
8	7.00	9.00	8.00	58	23.00	29.00	28.00
9	7.00	9.00	8.00	59	23.00	29.00	28.00
10	7.00	9.00	8.00	60	24.00	30.00	28.00
11	7.00	10.00	9.00	61	24.00	30.00	29.00
12	8.00	10.00	9.00	62	25.00	30.00	29.00
13	8.00	10.00	9.00	63	26.00	30.00	29.00
14	8.00	10.00	9.00	64	26.00	31.00	30.00
15	8.00	11.00	10.00	65	27.00	31.00	30.00
16	8.00	11.00	10.00	66	27.00	31.00	30.00
17	9.00	11.00	10.00	67	28.00	31.00	30.00
18	9.00	12.00	10.00	68	28.00	31.00	31.00
19	9.00	12.00	11.00	69	28.42	32.00	31.00
20	9.00	12.00	11.00	70	29.00	32.00	31.00
21	9.00	13.00	11.00	71	29.00	32.00	31.00
22	9.96	13.00	12.00	72	30.00	32.00	32.00
23	10.00	13.00	12.00	73	30.00	32.00	32.00
24	10.00	14.00	12.00	74	30.00	33.00	32.00
25	10.00	14.00	12.00	75	31.00	33.00	32.00
26	10.00	14.00	13.00	76	31.00	33.00	33.00
27	10.00	15.00	13.00	77	31.00	33.00	33.00
28	11.00	15.00	13.00	78	32.00	33.60	33.00
29	11.00	16.00	14.00	79	32.00	34.00	33.00
30	11.00	16.00	14.00	80	32.00	34.00	33.00
31	12.00	17.00	14.00	81	32.00	34.00	34.00
32	12.00	17.00	15.00	82	33.00	34.00	34.00
33	12.00	18.00	15.00	83	33.00	34.00	34.00
34	12.00	18.00	15.00	84	33.00	35.00	34.00
35	13.00	19.00	16.00	85	34.00	35.00	35.00
36	13.00	19.00	16.00	86	34.00	35.00	35.00
37	13.00	20.00	17.00	87	34.00	35.00	35.00
38	13.00	20.00	17.00	88	35.00	35.00	35.00
39	13.00	21.00	18.00	89	35.00	36.00	35.00
40	14.00	21.00	18.00	90	35.00	36.00	36.00
41	14.00	22.00	19.00	91	35.00	36.00	36.00
42	14.00	23.00	19.00	92	36.00	36.00	36.00
43	15.00	23.00	20.00	93	36.00	36.00	36.00
44	15.00	23.00	20.00	94	36.00	37.00	36.00
45	15.00	24.00	21.00	95	36.00	37.00	37.00
46	16.00	24.00	22.00	96	37.00	37.00	37.00
47	16.00	25.00	22.00	97	37.00	38.00	37.00
48	16.64	25.00	23.00	98	38.00	38.00	38.00
49	17.00	26.00	23.00	99	38.82	39.00	39.00
50	17.00	26.00	24.00	100	39.00	40.00	40.00

Table 3. Raw scores and related percentiles for Service Leadership Knowledge Scale (SLK-SF-40)

Raw Score	Percentiles		
	Male (N = 1517)	Female (N = 2969)	Total Sample (N = 4486)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	1.0	0.0	0.0
5	2.0	1.0	1.0
6	5.0	2.0	3.0
7	9.0	4.0	6.0
8	14.0	6.0	9.0
9	19.0	9.0	12.0
10	25.0	12.0	17.0
11	29.0	16.0	20.0
12	33.0	19.0	24.0
13	37.0	22.0	27.0
14	41.0	25.0	30.0
15	44.0	27.0	33.0
16	47.0	30.0	35.0
17	49.0	32.0	38.0
18	51.0	34.0	40.0
19	53.0	36.0	41.0
20	55.0	37.0	43.0
21	56.0	39.0	45.0
22	57.0	41.0	47.0
23	59.0	43.0	48.0
24	60.0	45.0	50.0
25	62.0	48.0	52.0
26	64.0	50.0	54.0
27	66.0	52.0	57.0
28	68.0	55.0	59.0
29	70.0	58.0	62.0
30	73.0	62.0	66.0
31	76.0	66.0	70.0
32	80.0	71.0	74.0
33	83.0	76.0	78.0
34	86.0	81.0	83.0
35	90.0	86.0	87.0
36	94.0	91.0	92.0
37	97.0	95.0	96.0
38	98.0	98.0	98.0
39	100.0	99.0	99.0
40	100.0	100.0	100.0

Noteworthy, the current study has two methodological strengths. First, we developed the norms based on a large and representative sample of university students coming from multiple higher education institutions in Hong Kong. Therefore, we believe that the generalizability of the findings is good. Second, we used an objective knowledge scale where the items were derived from a solid leadership framework. In addition, the validity and other psychometric

properties of the scale have been proved to be good. Thus, the norms can be regarded as reliable and valid in delineating university students' service leadership knowledge level.

Apart from the norms, our study adds to the extant literature on the potential correlates of university students' comprehension of service leadership. Three notable observations from the present findings could be highlighted. First, as expected, the university students' service leadership knowledge scores were not significantly associated with their age. This result indicates that the students will not gain a better understanding of the service leadership concepts automatically as time goes by. Instead, leadership training could be an effective means for knowledge acquisition. Indeed, previous studies suggest that leadership development among youth is closely related to their involvement in leadership training programs (45,46). The present study also found that overall leadership training experience was positively correlated to service leadership knowledge score, supporting the utility of conducting leadership training for youth. Nevertheless, the effect size of the correlation between leadership training experience and service leadership knowledge was not large. This may be because we did not specify the focus of leadership training. Although leadership training programs, regardless of their focus, may cover some common knowledge points which are also useful for increasing the understanding of service leadership, those training programs specifically focusing on service leadership may be more effective.

Second, also in line with our hypothesis, the female students demonstrated a higher knowledge level than did the male students. This is understandable because women are more service-oriented than men in nature, as evidenced by research findings showing that women tended to be more caring, relationship-oriented and empathetic than men (34-36). These qualities fit the demands of the service economy at the first place and help women better understand the service leadership concepts than men. Given this gender difference, two separate norms were established for female and male students. One practical implication of this finding is that gender effect should be considered when implementing and evaluating service leadership education programs.

Third, the participants' GPA was positively correlated with their service leadership knowledge score. For GPA, a better score usually indicates a student's better cognitive ability such as reasoning and problem solving skills (38), which may better enable them to infer what kind of leadership qualities can fulfill the needs of service economy. Fourth, we found that experience of being a leader in a student organization was associated with a higher service leadership knowledge score. This result also echoes the previous findings which suggested that serving in leadership roles in university exerts positive impacts on diverse student learning outcomes such as leadership efficacy (47). It is believed that student leadership in college embody a wide range of elements such as helping people, building relationship and working as a team (48), all of which are related to service leadership concepts, directly or indirectly.

Although the present study represents a pioneering effort to construct percentile norms and identify potential psychological correlates for service leadership knowledge, it has three limitations. First, we only investigated university students which may limit the generalizability of the findings to other populations. Future research will certainly benefit from employing a more heterogeneous sample of potential service leaders including employees in different economic sectors and constructing norms of service leadership knowledge accordingly. Second, we did not collect data in other Chinese communities. As service economy grows rapidly as well in mainland China where there is also a need to launch service leadership education programs, it is also necessary to build norms among mainland Chinese people for evaluation purpose. Thus, future research could go further by collecting data and comparing knowledge levels in different Chinese communities. The final limitation is related to the limited number of potential correlates considered in the present study. For example, we did not examine the influence of students' undergraduate major. As some of the knowledge points are not unique to service leadership, it is thus possible that students in certain majors can learn the knowledge from their own major subjects such as social work or psychology. Future studies could include students' major and other individual traits such as personality to examine and compare the relationships between these factors and service leadership knowledge level.

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Ethical compliance

The authors have stated all possible conflicts of interest within this work. The authors have stated all sources of funding for this work. If this work involved human participants, informed consent was received from each individual. If this work involved human participants, it was conducted in accordance with the 1964 Declaration of Helsinki. If this work involved experiments with humans or animals, it was conducted in accordance with the related institutions' research ethics guidelines.

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