DEVELOPMENT AND EVALUATION OF THE READABILITY, STABILITY AND INTERNAL CONSISTENCY OF A PSYCHOMETRIC INSTRUMENT DESIGNED TO ASSESS PHYSIOTHERAPISTS' KNOWLEDGE AND ATTRIBUTES OF PROFESSIONALISM

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ABSTRACT

Background and Purpose: There is currently no culturally appropriate instrument to assess Nigerian physiotherapists' knowledge and attributes of professionalism. This study sets out to develop a psychometric instrument to assess the knowledge and attributes of professionalism of Nigerian physiotherapists, and to investigate the instrument's readability, stability, and internal consistency. Methods: A Professionalism Inventory with eight demographic questions, ten knowledge of professionalism questions and sixteen attributes of professionalism perception-based statements was developed. The attributes of professionalism scale assess clinical competence, a spirit of inquiry, accountability, autonomy, advocacy, innovation and visionary, collegiality and collaboration, and ethics and values. The Inventory was completed on two occasions, after two-week interval, by 91 Nigerian physiotherapists. Results: The Inventory's average grade reading level was 10. The intra class correlation coefficient (ICC 3, 1) for the knowledge of professionalism scale ranged from "moderate" (0.421, p<0.001) to "substantial" (0.770, p<0.001). The Kendall's coefficient of concordance for the attributes of professionalism scale ranged from "fair" (0.368, p<0.001) to "moderate" (0.547, p<0.001). The Cronbach alpha for the knowledge of professionalism scale was "almost perfect" (0.813, p<0.0001); and "substantial" (0.780, p<0.001) for professionalism attributes scale. Conclusion: The knowledge and attributes of professionalism scales are stable and internally consistent. The availability of this psychometric instrument will promote studies of professionalism in physiotherapy.

Contribution/Originality: This study is the first psychometric instrument developed to assess Nigerian physiotherapists' knowledge and attributes of professionalism and also the first to document the instrument's readability, stability, and internal consistency statistical properties.

1. INTRODUCTION

Since physiotherapy was introduced into Nigeria in 1947 by two British physiotherapists, the profession has gradually evolved into a semi-professional status [1]. While the profession is striving to attain a true-professional status, entry-level doctoral education and post-professional clinical specialization training are currently the two front burner issues among the physiotherapists [2]. In 2015, the Nigeria Society of Physiotherapy (NSP) and the Medical Rehabilitation Therapists (Registration) Board of Nigeria submitted a proposal to the National Universities

Commission to upgrade the entry-level Bachelor of Physiotherapy degree program offered in the universities to an entry-level doctor of physiotherapy (DPT) degree program. Furthermore, the NSP has sponsored a Bill that is awaiting ratification by the National Assembly to establish the National Postgraduate Physiotherapy College of Nigeria (NPPCN). One of the primary goals of the NPPCN is to produce adequate number of clinical specialists in physiotherapy to stem the tide of medical tourism for physiotherapy services abroad [3]. The cost of medical tourism is annually over $1 billion; a critical resource that could be better used to develop the country's underfunded healthcare system.

As a result of the above developments in physiotherapy education, the issue of professionalism has taken center stage as physiotherapists are now expected to exude exemplary professional conduct and to model behaviors that are appropriate to a particular clinical situation. Thus, physiotherapist educators are being challenged to develop methods to teach and assess professional behavior associated with professionalism. Unfortunately, there is currently no professionalism assessment instrument that is culturally appropriate for physiotherapists in Nigeria.

The only psychometric instrument identified in the extant literature designed to measure professional behaviors and attitudes of physiotherapists is the "Physical Therapy Professionalism Core Values" (PTPCV) instrument that was developed in 2003 by the American Physical Therapy Association (APTA) [4]. The instrument allows an individual to self-evaluate his/her own professional core values, personal strength, and areas for growth. The PTPCV instrument consists of questions that respondents are expected to rate on a 5-point Likert scale: 1 = Never, 2 = Rarely, 3 = Occasionally, 4 = Frequently, 5 = Always [4]. Some of the weaknesses of PTPCV instrument is the fact that it is long (68 items); therefore, it is time consuming and laborious to complete. Although the tool is commonly used in physical therapy studies in the USA [5-10] there is a dearth of information on its reliability and validity. Furthermore, the instrument will need validation in other cultures for it to be applicable in research and clinical practice.

This investigation sets out to develop a user friendly and practical psychometric instrument to assess Nigerian physiotherapists' knowledge and attributes of professionalism and to investigate the instrument's readability, stability, and internal consistency statistical properties.

2. METHODS

2.1. Ethical Approval

The protocol for this study was approved by the Lagos University Teaching Hospital Health Research and Ethics Committee; Application # 05-08-15. Participation in the study was voluntary and no stipends or incentive was offered to the physiotherapists.

2.2. Research Design

The sample for this cross-sectional study was selected randomly from four of the twenty Federal University Teaching Hospitals. A total of 105 physiotherapists were initially recruited, but only 91 of them (87%) fully completed all the experimental conditions. Of the 91 participants, 15% were employed at Jos University Teaching Hospital, 23% at Lagos University Teaching Hospital, 28% at University College Hospital and 34% at Obafemi Awolowo University Teaching Hospitals Complex.

2.3. Development of the Professionalism Inventory

A literature search on professionalism was first undertaken to identify a psychometric instrument that will be culturally appropriate for Nigerian physiotherapists. The search was performed on the CINAHL, PubMed, and PsycINFO databases using the following combination of key-words: "professionalism", "measuring instrument", "reliability", "validity" and "readability." The search yielded several "hits" that are presented in Table 1.

Table-1. Number of professionalism "hits" obtained from the different literature search engines

Steps	Level of Search	CINAHL	PubMed	PsychInfo
1	Professionalism	6,768	6,245	5,371
2	Professionalism + Measuring tool	10	25	10
3	Professionalism + Measuring tool +Reliability	6	20	5
3	Professionalism + Measuring tool + Validity	3	17	4
3	Professionalism + Measuring tool + Readability	0	1	0

Source: CINAHL, PubMed, and PsycINFO databases

The analysis of the literature search outputs revealed that professionalism is a subject matter that has over the years been of interest to physiotherapists. In a seminal paper published in 1964 by Dr. Jacqueline Perry entitled "Professionalism in Physical Therapy", she discussed the methods used to teach professionalism, how to measure professionalism and several other topical issues that remain relevant today [5]. Similarly, an editorial by Julius Sim in the debut edition of the Journal of Physiotherapy Theory and Practice in 1985 extolled the importance and implication of the ethos of professionalism for physiotherapy [6]. Of the plethora of published articles on professionalism in other countries, only a few were empirically-based studies relevant to physiotherapy [7-13]. None of the published empirical studies on professionalism in physiotherapy were from Nigeria. The paucity of empirical-based studies on professionalism in physiotherapy may be due, in part, to lack of a practical, reliable and valid psychometric instrument.

We developed a Professionalism Inventory after an in-depth review of professionalism and professional identity extant literature. The framework our study was conceptualized from the identified professionalism assessment instruments in the literature summarized in figure 1.
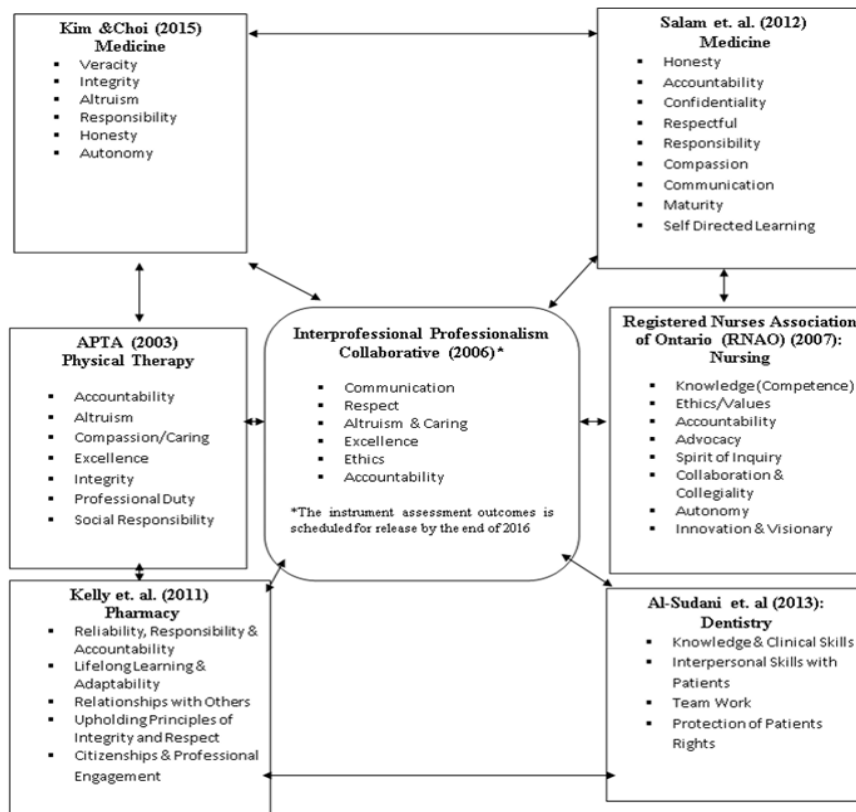

Figure-1. Fundamental elements/core values/attributes of professionalism.
Source: The authors created the diagram

The word "professionalism" was derived from the Latin word "profesus" which means "to have declared publicly" [14]. From ancient times, professions do declare publicly that their members will act or behave in an ethical manner and may discipline those who fail to do so. Professions traditionally issue a code of ethics that enunciates the standards by which members can be judged. To emphasis the importance of professionalism, Sir William [15] stated that "the practice of medicine is not a business and can never be one … Our fellow creatures cannot be dealt with as a man deals in corn and coal; the human heart by which we live must control our professional relations."

Professionalism entails a continuum of behaviors, attitudes, and beliefs that are on one end of the spectrum is as basic or generic as "doing the right thing" to highly complex and altruistic genre at the other end of the spectrum [1]. Professionalism is a multi-dimensional social construct with no simple and universally accepted definition. It is easy to recognize professionalism, but it is difficult to measure because it is kaleidoscopic [16, 17]. Different terms such as attributes of professionalism [18, 19] fundamental elements of professionalism [20, 21] attitudinal/behavioral professionalism [12] and professionalism core values [4] are used in the literature to describe professional behaviors and attitudes of health workers. In this study, attributes of professionalism will be used to describe the core beliefs, attitudes, and behaviors of physiotherapists. Professionalism was defined in this study as the consistent demonstration of clinical competence, a spirit of inquiry, accountability, autonomy, advocacy, innovation and visionary, ethics and values, collegiality and collaboration by working together with other professionals to achieve optimal health and wellness in individuals and the communities.

The theoretical framework for this study was guided by the professional identity theory which is concerned with group interactions in the workplace as it relates to how people compare and differentiate themselves from other professional groups [22]. Our theoretical model embodied the core values, beliefs, attitudes, unique clinical skills and roles of the physiotherapists within the health care system [23-27]. Specifically, the questions on our Professionalism Inventory assesses constructs such as clinical competence and knowledge (items # 19, 20, 21, 24, 30), life-long learning (items #22, 32), professional autonomy (items #25, 26), caring for patients and their families (items # 27, 28), cultural sensitivity (item #29), team approach to treatment (items #23, 31), and ethical practice (items #33, 34).

Our Professionalism Inventory consisted of three subscales. We constructed the demographic and the knowledge of professionalism scales but adapted the attributes of professionalism scale from a survey instrument developed by the Registered Nurses Association of Ontario (RNAO) [18]. The demographic subscale asks two open-ended questions (the date of birth and number of years of clinical experience) and six other demographic information such as gender, marital status, highest education, place of employment, clinical practice area and practice setting. The knowledge of professionalism subscale asks ten questions designed to assess respondents' basic understanding of professionalism. Each issue has a "Yes," "No" or "Don't know" response options. We formulated the knowledge of professionalism questions from our understanding of the recent challenges and developments in physiotherapy education and practice in Nigeria [1, 2].

The attributes of professionalism subscale ask respondents to rate their opinion about certain professional behaviors and attitudes on a 5-point Likert scale ranging in a continuum from "Strongly Disagree" (1) to "Strongly Agree (5)." The sixteen perception-based statements were classified into eight subscales to measure: clinical competence, a spirit of inquiry, accountability, autonomy, advocacy, innovation and visionary, collegiality and collaboration, and ethics and value.

The initial draft of the instrument was revised several times by the three investigators. Five physiotherapists with an average of 12.5 years clinical experience reviewed the final draft produced by the researchers to assess the face validity and clarity of the questions. Based on their feedback, several items were again rewritten to improve comprehension. Following the peer review, the readability of the Professionalism Inventory was determined using standard test procedures [26].

2.4. Data Collection Procedures

First, we explained the purpose of the study and risks to all potential study participants. Second, they were provided the informed consent form to complete. Subsequently, they were provided the Professionalism Inventory and instructed to answer the questions as honestly and as accurately as possible. Also, they were informed that there were no rights or wrong answers for the sixteen attributes of professionalism perception-based statements. We did not impose any time limit for the completion of the Professionalism Inventory, but most respondents completed it in less than 20 minutes. Each respondent completed the Professionalism Inventory on two occasions after a two-week interval.

On the second occasion, we maintained similar testing conditions and the same research staff members administered the inventory at each of the four study locations. For test-retest matching purposes, the respondents' date of birth and different color papers were used during the data entry and data analysis to identify each study participant.

2.5. Scoring the Professionalism Inventory

We computed the aggregate knowledge of professionalism subscale score by adding up the number of correct responses out of ten questions expressed as a percentage. No partial score was assigned for "Don't Know" response. The minimum and maximum possible score on the knowledge of professionalism scale is 0 and 100%, respectively. A high knowledge score indicates that the respondent is well informed about professionalism.

We derived the attributes of professionalism subscale score   as follows: (1) Competence, add up item 19 & 20; (2) A Spirit of Inquiry, add up item 21 & 22; (3) Accountability, add up item 23 & 24; (4) Autonomy, add up item 25 & 26; (5) Advocacy, add up item 27 & 28; (6) Innovation and Visionary, add up item 29 & 30; (7) Collegiality and Collaboration, add up item 31 & 32; (8) Ethics and Value, add up item 33 &34. We computed the aggregate attributes of professionalism subscale score by adding up the respondents' ratings on questions 19 to 34. The minimum possible score on the attributes of professionalism subscale is 16, and the maximum possible score is 80. A high aggregate score indicates that the individual imbibes high core values of professionalism.

2.6. Statistical Analysis

The data collected were analyzed with the Statistical Package for Social Scientists (SPSS) computer-based software, version 16. Both descriptive and inferential statistics were computed. The mean and standard deviation were calculated for continuous (ratio) data: age, aggregate knowledge, and attributes of professionalism scores. We calculated median data instead of mean for the attributes of professionalism because it is an ordinal data on a 5-point scale. Chi-square (χ^2) was calculated to determine plausible differences between the percentage of correct responses on the knowledge of professionalism questions on test day 1 and test day 2 (two weeks later).

We computed intra-class correlation coefficient (ICC1, 3) and the 95% confidence intervals (CI) for each of the ten knowledge questions. ICC was used to assess how stable respondent's answers were over two week's time interval for knowledge of professionalism continuous (ratio) data. The two-way mixed population of raters (ICC 3, 1) model was used [28]. Furthermore, we computed Kendall's coefficient of concordance (KCC) for each of the sixteen perception-based attributes of professionalism statements (ordinal level data). KCC is the degree of association of ordinal assessments made by multiple testers when assessing the same samples in attribute agreement analysis [29].

The Cronbach's alpha (α) coefficient was also computed to determine the internal consistency of the knowledge of professionalism and attributes of professionalism scales. Cronbach's alpha (α) coefficient captures the degree to which related items measure the same concept. We used the guidelines proposed by Landis and Koch [30] to interpret the ICC, Cronbach's α, and KCC data. An agreement level between 0–0.2 was described by Landis and Koch [30] as "poor," 0.2–0.4 "fair," 0.4–0.6 "moderate", 0.6–0.8 "substantial," and 0.8-0.9 "almost perfect."

3. RESULTS

3.1. Study Participants

The profile of the subjects (N=91) who participated in the study is presented in Table 2. Their mean (standard deviation) age was 31.7±6.23 years (Table 2).

Table-2. Subjects' demographic data (N = 91)

Item #	Variables	Frequency	Percentage
1	Gender		
	Male	54	59.3
	Female	37	40.7
2	Marital status		
	Single	51	56.0
	Married	40	44.0
	Separated (Divorced)	0	0.0
3	Age (years)		
	≤ 30	44	48.4
	31-40	38	41.7
	>40	9	9.9
4	Degree type		
	Bachelor's	54	59.3
	Master's	24	26.4
	Doctorate	13	14.3
5	Work setting		
	State/Federal government	46	50.5
	Private establishment	8	8.8
	Teaching/Specialist hospital	35	38.5
	Others	2	2.2
6	Area of practice		
	Academia	19	20.9
	Clinical	72	79.1
7	Work experience (years)		
	≤ 5	47	51.6
	6-10	19	20.9
	11-15	14	15.4
	>15	11	12.1
8	Practice setting		
	Orthopedics/Sports	27	29.7
	Pediatrics	6	6.6
	Neurology	16	17.6

Source: Table was compiled by the authors from the SPSS printouts

The majority of the physiotherapists were males (59.3%), under 30 years old (48.4%), single (56.0%), bachelor degree holders (59.0%) and had between 1 and five years of professional experience (51.6%). The preponderance of the physiotherapists (79.1%) was employed in the hospital setting, and 21% worked as physiotherapy consultant in the teaching hospital and/or Lecturer in the physiotherapy program at the university. The clinicians were

employed in diverse practice settings such as orthopedics/sports, neurology, pediatrics, and general practice. The majority of the subjects (50.5%) worked in Federal or State government owned institutions.

The profile of the subjects (N=91) who participated in the study is presented in Table 2. Their mean (standard deviation) age was 31.7±6.23 years (Table 2)..

3.2. Readability of the Professionalism Inventory

The readability measures for the Professionalism Inventory are presented in Table 3.

Table-3. The readability indices, text quality, reading time and text statistics for the Professionalism Inventory

Serial Number (S/N)	Readability indices	Score
1	Flesch-Kincaid grade level	6.9
2	Gunning-Fog score	9.1
3	Coleman-Liau index	17.1
4	SMOG index	9.4
5	Automated readability index	7.7
6	Average grade level	10.0
7	Flesch-Kincaid Reading Ease	55.3
8	Spache score	3.4
9	New Dale-Chall score	6.3
	Text quality	
10	Sentences > 30 syllables	12
11	Sentences > 20 syllables	16
12	Words > 4 syllables	64
13	Words > 12 syllables	51
14	Passive voice count	3
15	Adverb count	19
16	Cliché count	0
	Reading time	
17	Reading time	3.18
18	Speaking time	5.58
	Text statistics	
19	Character count	4,173
20	Syllable count	1,457
21	Word count	746
22	Unique word count	364
23	Sentence count	136
24	Characters per word	5.6
25	Syllables per word	2.0
26	Words per sentence	5.5

Source: Table was compiled by the authors from the print out obtained from https://readability-score.com website

The instrument Flesch-Kincaid Reading Ease and Flesch-Kincaid scores were 53.3 and 6.9, respectively. The Flesch-Kincaid and the Flesch Reading Ease scores are a measure of the literacy difficulty level. A Flesch-Kincaid score of 6.9 indicates that a minimum of a 7th-grade reading level is required to be able to comprehend the contents

of the survey fully. A Flesch Reading Ease score of 53.3 indicates that the test is relatively easy to understand. The instrument's average grade reading level was 10, and it is attainable by age 15; which is equivalent to Year 11 of education in the British system on which Nigerian schools are modeled after [31].

The text quality was 12 and 16 for sentences with greater than 30 and 20 syllables, respectively. The reading time was 3.18 minutes, and speaking time was 5.58 minutes. The Professional Inventory text character and syllable counts are 4,173 and 1,457, respectively. The average word per sentence was 5.5. Based on the satisfactory readability assessment that indicates the Professional Inventory is relatively easy to comprehend [26] the investigators proceeded to evaluate its psychometric properties.

3.3. Stability and Internal Consistency of the Knowledge of Professionalism Subscale

The percentage of the correct response on the knowledge of professionalism questions during the two occasions (test day 1 and test day 2) when the inventory was administered are presented in Table 4.

Table–4. Percentage of the correct responses on the knowledge of professionalism questions (N=91)

Item #	Knowledge of professionalism questions	Test Day 1 %	Test Day 2 %	χ^2	p-value
9	Professionalism is exclusively about knowledge and competence.	23.1	27.5	0.465	0.495
10	Occupational status is the ordered ranking to which the public or peer professional groups confer on a particular occupation.	74.7	71.4	0.251	0.616
11	Occupational esteem is the regard in which an occupation is being held by the general public by virtue of its power, and other qualities such as altruism, competence and financial worth.	80.2	81.3	0.035	0.851
12	A semi-profession has esteem and political power and is often associated with sound specialized educational training.	41.8	40.7	0.023	0.880
13	A profession has lower occupational status and relatively shorter training periods with less autonomy in clinical decision making	79.1	82.4	0.318	0.573
14	A profession often lacks societal acceptance and less highly developed body of knowledge and skills	79.1	79.1	0.000	1.000
15	Professional autonomy is the right to determine own standards of education, legal recognition and control by members of the profession	92.3	93.4	0.083	0.773
16	The legislation that established the Nigeria Medical Rehabilitation Therapists' Board granted physiotherapist direct access and patients self-referral privileges	37.4	37.4	0.000	1.000
17	The practice of physiotherapy in Nigeria today will be ranked as a "semi-profession."	27.5	26.4	0.028	0.867
18	At the inception of the physiotherapy profession in Nigeria, physiotherapist educators have similar academic credentials as their colleagues within the academy.	54.9	49.5	0.551	0.458
	Aggregate knowledge of professionalism score (%)	60.0 ± 1.76	59.0 ±1.66		
	Cronbach α for the knowledge of professionalism scale	0.813; p<0.0001			

Source: Table was compiled by the authors from the SPSS printouts

The percentage of correct responses presented in Table 4 reflects the difficulty level of the ten knowledge questions. For example, item # 9 (Professionalism is exclusively about knowledge and competence) was correctly

answered by less than 30% of the physiotherapists on both occasions. On the other hand, the majority of the physiotherapists (greater than 90%) correctly answered item # 15 (Professional autonomy is the right to determine own standards of education, legal recognition, and control by members of the profession) on both occasions. The result of the Chi-Square test for the knowledge of professionalism questions revealed no statistically significant difference (p>0.05) between the answers provided by the physiotherapists on test day 1 and test day 2. The findings attest to the stability of the Professionalism Inventory.

The mean aggregate knowledge of professionalism score on test day 1 and test day 2 was 60.0% ± 1.76 and 59.0% ± 1.66, respectively. The Cronbach α for the knowledge of professionalism scale was "almost perfect" (0.813, p<0.0001).

The mean aggregate knowledge of professionalism score on test day 1 and test day 2 was 60.0% ± 1.76 and 59.0% ± 1.66, respectively. The Cronbach α for the knowledge of professionalism scale was "almost perfect" (0.813, p<0.0001).

The ICC for the ten knowledge of professionalism questions is presented in Table 5.

Table-5. Intra-class correlation coefficient (ICC) for the knowledge of professionalism questions (N=91)

Item #	Knowledge of professionalism questions	ICC*	95% CI** Lower and Upper Scores
9	Professionalism is exclusively about knowledge and competence	0.770	0.673 − 0.843
10	Occupational status is the ordered ranking to which the public or peer professional groups confer on a particular occupation.	0.635	0.491 − 0.745
11	Occupational esteem is the regard in which an occupation is being held by the general public by virtue of its power, and other qualities such as altruism, competence and financial worth.	0.421	0.235 − 0.577
12	A semi-profession has esteem and political power and is often associated with sound specialized educational training.	0.520	0.352 − 0.656
13	A profession has lower occupational status and relatively shorter training periods with less autonomy in clinical decision making	0.472	0.296-0.617
14	A profession often lacks societal acceptance and less highly developed body of knowledge and skills	0.583	0.429 − 0.705
15	Professional autonomy is the right to determine own standards of education, legal recognition and control by members of the profession	0.467	0.289 − 0.693
16	The legislation that established the Nigeria Medical Rehabilitation Therapists' Board granted physiotherapist direct access and patients self-referral privileges	0.530	0.365 − 0.663
17	The practice of physiotherapy in Nigeria today will be ranked as a "semi-profession."	0.749	0.643 − 0.827
18	At the inception of the physiotherapy profession in Nigeria, physiotherapist educators have similar academic credentials as their colleagues within the academy.	0.756	0.652 − 0.832
	Aggregate Knowledge of Professionalism Score	0.685	0.558 − 0.780

Source: Table was compiled by the authors from the SPSS printouts
*ICC =Intra-class correlation coefficient; p<0.001
**CI = Confidence interval

The ICC for the ten knowledge of professionalism questions ranged from "moderate" (0.421, p<0.01) for item # 11 to "substantial" (0.770, p<0.001) for item # 9. The ICC for the aggregate knowledge of professionalism score was "substantial" (0. 685, p<0.001).

3.4. Stability and Internal Consistency of the Attributes of Professionalism Subscale

The median and 95% CI for the attributes of professionalism subscales on the two testing occasions (test day 1 and test day 2) are presented in Table 6.

Table-6. Median score and the Cronbach α for the attributes of professionalism subscales (N=91)

Variable	Test Day 1	Test Day 2
Attributes of Professionalism subscales	Median	Median
Clinical Competence	4.5	4.5
A Spirit of Inquiry	4.5	5.0
Accountability	4.5	4.5
Autonomy	4.0	4.0
Advocacy	4.0	4.0
Innovation and Visionary	4.0	4.0
Collegiality and Collaboration	4.5	4.0
Ethics and Value	4.0	4.0
Aggregate Attributes of Professionalism Score	69.0	67.0
Cronbach α for the Attributes of Professionalism subscales	0.780; p<0.001	

Source: Table was compiled by the authors from the SPSS printouts

The median aggregate attributes of professionalism score on test day 1 and test day 2 was 69.0 and 67.0, respectively. The Cronbach α for the attributes of professionalism scale was "substantial" (0.780, p<0.001). The KCC for the sixteen attributes of professionalism perception-based statements is presented in Table 7.

Table-7. Test-retest reliability for the attributes of professionalism perception-based statements

Item #	Attributes of professionalism statement	KCC*	95% CI* Lower and Upper Scores
19	I have physiotherapy knowledge that is both theoretical and clinical based	0.436	0.406 − 0.689
20	I use evidence-based knowledge in my academic/clinical practice	0.533	0.557 − 0.780
21	I am open minded and have the desire to explore new knowledge	0.470	0.564 − 0.783
22	I am committed to life-long learning	0.368	0.368 − 0.665
23	I work with both clients and families to achieve desired outcomes	0.484	0.578 − 0.791
24	I recognize my capabilities, knowledge base and areas for development	0.491	0.567 − 0.785
25	I work independently and engage in decision-making within the scope of physiotherapy practice	0.547	0.499 − 0.746
26	I am aware of the barriers that interfere with my autonomy and I am seeking ways to address the situation	0.545	0.114 − 0.293
27	I understand the patient's perspectives	0.372	0.307 − 0.625
28	I assists patients with their learning needs	0.462	0.539 − 0.769
29	I promote a culture of innovation to enhance patient/family outcomes	0.513	0.525 − 0.761
30	I show initiatives for new ideas	0.530	0.526 − 0.762
31	I collaborate with other professionals	0.418	0.423 − 0.700
32	I mentor students and junior colleagues to enhance their professional growth	0.513	0.461 − 0.723
33	I am knowledgeable about ethical values, concepts and decision-making	0.423	0.489 − 0.740
34	I am able to identify ethical concerns, issues and dilemmas in clinical practice	0.497	0.509 − 0.752
	Aggregate Attributes of Professionalism Score	0.607	0.480 − 0.735

Source: Table was compiled by the authors from the SPSS printouts
*Kendall's coefficient of concordance (KCC); p<0.001
**CI = Confidence Interval

The KCC for the sixteen attributes of professionalism statements ranged from "fair" for statement #22 (0.368, p<.001) to "moderate" for statement #25 (0.547, p<.001).

Using the interpretation scheme proposed by Landis and Koch [30] we found that all the eight demographic questions showed "perfect" (k = 1.0; p<0.0001) correlation after two weeks retest interval (Table 8).

Table-8. Number of test-retest reliability coefficient within the category

S/N	Test-retest Reliability Coefficient*	Kappa or weighted Kappa (k) for Demographic Data Scale	ICC** for Knowledge of Professionalism Scale	KCC^ for the Attributes of Professionalism Scale	Interpretation*
1	$0.0 - 0.2$	0	0	0	Poor
2	$> 0.2 - 0.4$	0	0	2	Fair
3	$> 0.4 - 0.6$	0	6	14	Moderate
4	$> 0.6 - 0.8$	0	4	0	Substantial
5	$> 0.8 - 0.9$	0	0	0	Almost Perfect
6	$> 0.9 - 1.0$	8	0	0	Perfect
	Total number of questions	8	10	16	

*Landis and Koch [30]
**Intra-class correlation coefficient (ICC)
^Kendall's coefficient of concordance (KCC)

Six of the ten knowledge of professionalism questions showed "moderate" (ICC = $0.4 - 0.6$; p<0.001) correlation; four of the knowledge of professionalism questions showed "substantial" (ICC = $0.6 - 0.8$; p<0.001) correlations. Similarly, fourteen of the sixteen attributes of professionalism perception-based statements showed "moderate" (KCC = $0.4 - 0.6$; p<0.001) correlation. Only two of the attributes of professionalism perception-based statements showed "fair" (KCC = $0.2 - 0.4$; p<0.001) correlation.

4. DISCUSSION

There is currently no culturally appropriate instrument to assess Nigerian physiotherapists' knowledge and attributes of professionalism. The investigators, therefore, set out to develop a practical tool to assess physiotherapists' basic understanding and attributes of professionalism and to investigate the readability, internal consistency and test-retest reliability properties of the new instrument. To our knowledge, this is the first study to assess the knowledge and attributes of professionalism of Nigerian physiotherapists.

The attributes of professionalism scale in this study was adapted from an existing professionalism instrument developed for use in nursing [18]. Following an extensive search of the literature on the CINAHL, PubMed and PsycINFO databases, we found no published study on the psychometric properties of the nursing professionalism assessment instruments [18]. However, the instrument has been used to assess the factors that influenced professionalism of nurses in Mekelle Public Hospitals, North Ethiopia [19]. Only sixteen of the 34-items of the attributes of professionalism in the nursing instrument [18] that were relevant to physiotherapy were selected. The adapted attributes of professionalism perception-based statements were rewritten to address cultural sensitivity issues and Nigerian sociological norms.

The findings in our study revealed that the Professionalism Inventory knowledge and attributes of professionalism scales are reliable and internally consistent. The two attributes of professionalism perception-based statements with "fair" stability correlations were #22 and #27 (which states "I am committed to life-long learning" and "I understand the patient's perspectives"). This finding suggests the need to refine questions #22 and #27 to improve their test re-test reliability coefficient.

To date, only seven studies [7-12] were identified in the literature that has investigated the psychometric properties of the PTPCV instrument developed by the APTA to measure professionalism core values of American physical therapists American Physical Therapy Association (APTA) [4]. Anderson and Irwin [7] used the

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Messick's unified construct-based concept of validity approach to evaluate the psychometric properties of the aggregate PTPCV and its subscale scores. She found the aggregate PTPCV score had greater consistency, stability and reproducibility than the seven domain scores. She postulated that the issues regarding "content, structure and generalizability prevent PTPCV from having summative assessment utility in physical therapy program." Using exploratory factor analysis statistical approach, Denton, et al. [8] evaluated the reliability and validity of the Social Responsibility subscale of the PTPCV instrument among first year entry-level doctor of physical therapist students (N = 52). They found strong internal consistency reliability for 14 items (Cronbach's alpha of .926), and 15 items (Cronbach's alpha of .917) out of the 68 items measuring instrument. They concluded that additional studies are needed to establish the reliability and validity of the remaining six subscales of the PTPCV instrument.

The Cronbach's alphas obtained in our study (0.813, and 0.780 for knowledge and attributes of professionalism scales, respectively) are lower than those reported by Denton, et al. [8]. The comparisons were made with a dose of caution because the study samples in both studies are culturally different (Nigerians vs. Americans). Furthermore, physical therapist students were the respondents in Denton, et al. [8] study. On the contrary, practicing physiotherapists were the respondents in this study.

In sum, this study found the internal consistency and test-retest reliability of the Professionalism Inventory to be acceptable within the guidelines established for psychometric instruments [29, 32-34]. Even though our present findings provided strong evidence for the stability and internal consistency of the Professionalism Inventory instrument, follow-up studies to evaluate the content validity of the Professionalism Inventory against the PTPCV is warranted.

4.1. A *priori* Evaluation

Although not one of the stated objective of this study, following data analysis, we sought to identify the attributes of professionalism that are common between the Professionalism Inventory and the existing professionalism instruments used in the various health disciplines. We drew lines to connect the attributes of professionalism that are common to the Professionalism Inventory and the other professionalism assessment instruments. The *a priori* evaluation is represented in Figure 2.

As shown in the Venn diagram, only a few of the attributes of professionalism are common among the various instruments. This finding suggests that the professionalism instrument used in the various health professions focuses on different professionalism behaviors.

4.2. Implications and Limitations of the Study

The availability of a reliable and valid professionalism instrument will allow physiotherapy profession to answer several basic content questions. For example, it will provide clarity on issues such as how physiotherapists from different socio-demographic, cultural and educational backgrounds may vary in their integration of professional core values into their clinical practice and how educational interventions impact professionalism. Also, it will provide clarity on the variations in the professional norms of the physiotherapist from different cultures, and the differences in the professional standards across the various health professions.

Both the PTPCV instrument and the Professionalism Inventory developed in this study are designed to measure physiotherapists' attributes of professionalism. However, the *a priori* analysis undertaken revealed that only two of the attributes of professionalism subscales (accountability and excellence/competence) are measured by both instruments (Figure 2). Given this findings, we speculate that the APTA's PTPCV instrument and our Professionalism Inventory may be assessing different attributes of professionalism. This observation underscores the lack of universal agreement on what constitutes professionalism. Follow-up content validity studies are needed to support our speculation.
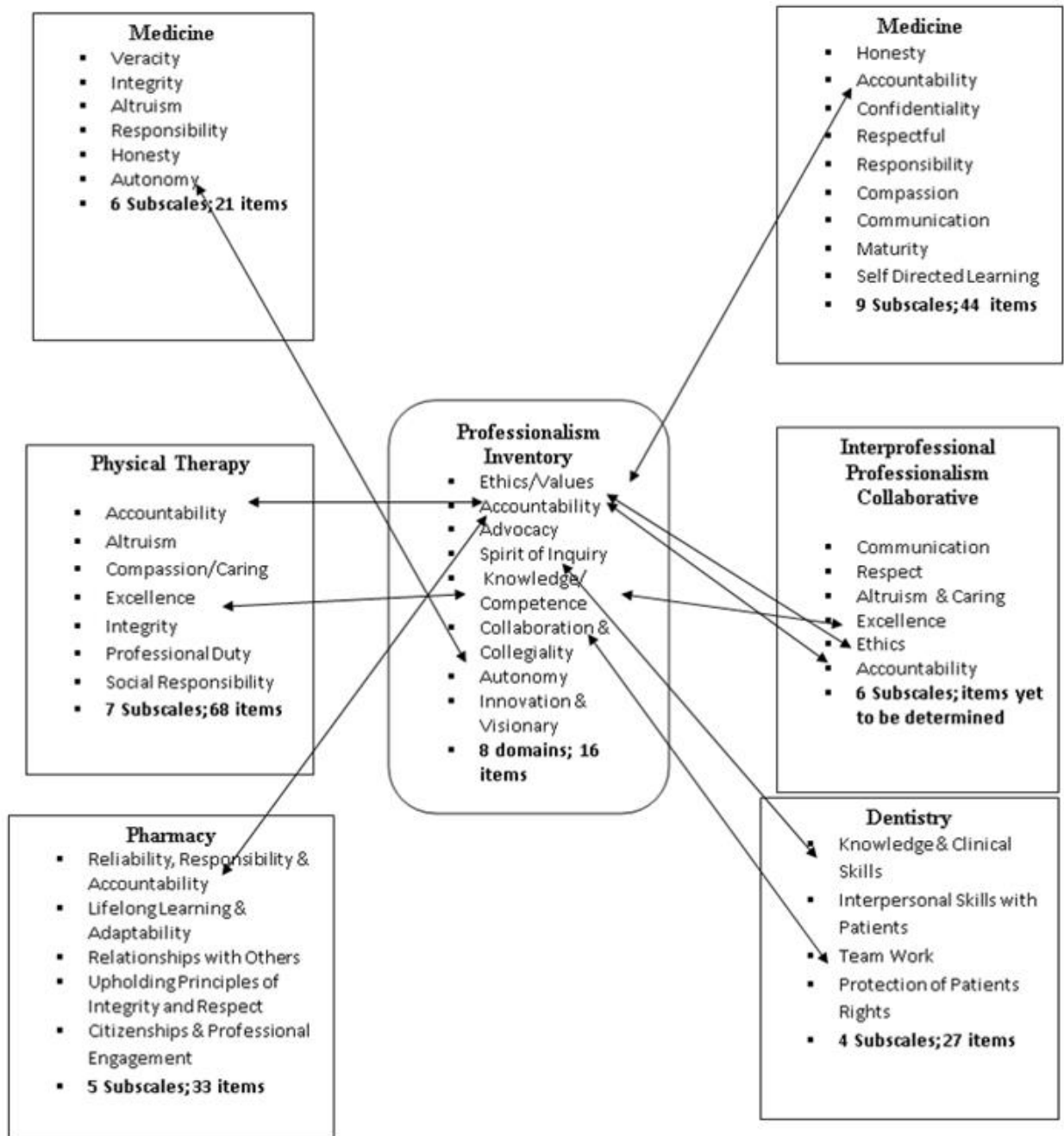
Fig-2. Highlights of the Professionalism Inventory subscales compared with the subscales of the professionalism instrument from the other health professions
Source:: The authors created this Venn diagram

A major limitation in assessing the professionalism of physiotherapists is the lack of a practical and user-friendly psychometric instrument. The Professionalism Inventory developed in this study has only 34-items: eight demographic questions, ten knowledge of professionalism questions and sixteen attributes of professionalism questions. On the other hand, the PTPCV instrument developed by the APTA has 68 core values (attributes) of professionalism items [4]. The Professionalism Inventory formulated in this study, because of its brevity and documented excellent psychometric properties, should find wider application in physiotherapy research.

The physiotherapists in this study were recruited from four randomly selected University Teaching Hospitals, out of the 20, in Nigeria [34]. Another limitation of our study is the relatively small sample size. There are currently about 2,000 actively practicing physiotherapists in Nigeria today [35]. The sample in our study (N=91),

constitutes less than 5% of the target population. Follow up validation and normative studies using larger sample size is warranted.

A unique feature of the Professionalism Inventory that differentiates it from the other published professionalism assessment instruments is that it can evaluate both knowledge and attributes of professionalism. Other professionalism assessment tools do not have a knowledge scale. The knowledge scale of the Professionalism Inventory showed the highest test-retest reliability, followed by the professionalism attributes scales.

5. CONCLUSIONS

Overall, the Professionalism Inventory developed in this study was found to be stable and internally consistent. Because of its brevity and documented excellent psychometric properties, this instrument should promote the study of professionalism among physiotherapists in Nigeria. Given that the culture and educational system of the Anglophone African countries are similar, the Professionalism Inventory potentially should have application in other African countries beyond Nigeria following translation and adaptation of the items.

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