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Gender differences in physical education conceptual knowledge on physical education teacher education (PETE) students

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Abstract

This study intended to measure the gender differences in physical education sub disciplinary conceptual knowledge in Physical Education Teacher Education (PETE) students in Kerala, India. The study was conducted on 544 PETE trainees, including 372 male and 172 female undergoing training in VHSE, CPed, BPed, BPE, MPed and MPE courses in the state of Kerala only. The ASK-PE battery developed to assess beginners' magnitude of conceptual knowledge by Ayers, S. F. (2001b) was used as the tool. The sub-disciplinary conceptual knowledge areas include Aesthetic Experiences, Biomechanics, Exercise Physiology, Historical Perspectives, Motor Development, Motor learning and Social Psychology. According to the findings of this study, it can be concluded that female students are having more physical education conceptual knowledge than male physical education teacher education students in the state of Kerala.

Keywords: conceptual knowledge, physical education teacher education (PETE), aesthetic experiences, biomechanics, exercise physiology, historical perspectives

Introduction

The thinking-related domain aims to develop the mental skills and the learning of knowledge of the individual. The thinking-related domain includes six categories which include knowledge; understanding; application; analysis; (creation/combination); and (process of figuring out the worth, amount, or quality of something). While the cognitive domain has long been emphasized as a critical component of a good physical education program (American Alliance for Health, Physical Education, and Recreation, 1969; National Association for Sport and Physical Education [NASPE], 1995; Placek & Griffin, 2001) [20], it continues to be the least represented outcome in our profession (Lawson, 1987) [14]. According to present day teacher education, content knowledge and pedagogy have to be studied jointly, however, it is equally clear that to do so, the parameters of the content knowledge domain must be identified. The value of conceptual physical education knowledge has long been acknowledged (American Alliance for Health, Physical Education, and Recreation, 1969; Kneer, 1981; NASPE, 1995) yet has not been formally measured or assessed. Participants' lack of understanding about fitness concepts was disconcerting, particularly given the recent emphasis on health-related fitness by AAHPERD and most other national health organizations such as the Center for Disease Control, the US Department of Health and Human Services and the President's Council on Physical Fitness.

The decline in physical activity level is more pronounced for girls than boys, with Healthy People 2000 (U.S. Public Health Service, [USPS], 1991), 2010 (USDHHS, 2000) and the Surgeon General (USDHHS, 1996) reporting that girls are at a disproportionate risk for the health problems associated with physical inactivity. There is also evidence that girls are less active than boys in physical education classes (USDHHS, 2000). Typical physical education programs may be contributing to the problem of the accelerating decline in physical activity engagement, rather than being part of the solution to increase adolescent girls' physical activity (Ennis, 1999). Because of this, it is important to understand why girls become less active and the role that physical education plays in this process.

Additionally, it is important to explore ways to use physical education to increase physical activity and promote healthy lifestyles, especially in girls and to develop a better understanding of effective teaching in physical education contexts.

The lack or difference in the cognitive aspect of the physical fitness may be a reason restricting them from active involvement in physical activities. Since knowledge in the thinking-related domain is very important to student performance, teachers need the skills to develop that knowledge in students. Teachers' ability to do this, however, rests mostly on their own level of content-related thinking-related knowledge. The purpose of the study was to find out any significant differences exist in physical education sub disciplinary conceptual knowledge of Physical Education Teacher Education (PETE) trainees belonging to different gender in Kerala.

Methods and Materials

Participants

The study was conducted on 544 PETE trainees, including 372 male and 172 female PETE trainees doing various courses within the state of Kerala only. With ASK-PE Battery (Ayers, S. F., 2001b) [3], a sheet to collect some demographic information regarding the course in which they are studying, gender and name of the institution also was given. These details were used for grouping the participants in the testing programme. In the present study 39 (7.2%) were from VHSE, 56 (10.3%) were from CPed, 142 (26.1%) were from BPed, 40 (7.4%) were from BPE, 221 (40.6%) were from MPed and 46 (8.5%) were from MPE courses.

Instrumentation

Ayers (2001b) [3] developed a seven-test (group of tests), to evaluate the sub conceptual areas knowledge in Physical Education known as ASK-PE. The ASK-PE battery was developed to assess beginners' magnitude of sub disciplinary conceptual knowledge in physical education. The ASK-PE test battery provided a valid and reliable representation of the conceptual physical education knowledge delineated in Mohnsen's (1998) [18] text. PETE students' level of conceptual knowledge can be reliably assessed with this battery. The sub-disciplinary conceptual knowledge areas include Aesthetic Experiences, Biomechanics, Exercise Physiology, Historical Perspectives, Motor Development, Motor learning and Social Psychology. There were 120 multiple choice questions in different sub-disciplinary areas. Through this use, will enable us to make a direct comparison between the conceptual knowledge of future teachers belonging to different gender within Kerala. Using this type of comparative information, Physical Education Teacher Education (PETE) faculty can determine what is the level of future PETE students/graduates and which are the areas they are to develop to make physically literate children.

Administration of Test

The research scholar administered the test directly with the help of the teachers from the selected colleges/institutes. Prior to the administration of the test student teachers were informed that, the results of this test will not affect their grades and purpose of the study also was explained to the PETE trainees. Each PETE students received a packet of test materials (ASK-PE Battery) and instructions regarding test administration and after administering the test, scholar collected answer sheets in sealed box.

Results of the Study

The data were analysed by using IBM-SPSS Version 25.0. Descriptive analysis, *t*-test and Chi-square tests were performed to find out the differences and relationships. To study the Physical Education conceptual knowledge standard tool, ASK-PE Battery (Ayers, S. F., 2001b) [3], containing 120 questions was administered. The score for each sub disciplinary concept was based on the number of questions pertaining to the subdiscipline. The total score of conceptual knowledge is the aggregate of the scores obtained by them in the above seven sub disciplinary areas.

Aesthetic Experience of the respondent is a measure of his/her ability in assessing or judging the aesthetic component of movement and characteristics of movement patterns. Beauty-related perception and judgement are not only thinking-related processes, but also involve feelings. To assess this subdisciplinary component, 10 questions were included in the tool which comprises of 120 questions. The maximum score that a participant can score in this subdiscipline was 10. The mean score of 172 females was 5.38 with a standard deviation of 1.77 and for male it was 4.89 with a standard deviation of 1.8. The mean percentage score on aesthetic experiences was 48.9% for males and 58% for females.

An independent sample "*t*" test was performed for comparing the mean consistency scores of PETE students on physical education sub disciplinary conceptual knowledge – Aesthetic Experiences. There was a significant difference found between the mean scores for male ($M=4.90$, $SD=1.8$) and female ($M= 5.38$, $SD=1.11$) in aesthetic experiences; $t(542) = 2.958$, $p < 0.003$. These results show that, there were significant differences exists between the groups and female students' knowledge score was higher than the male PETE students in the physical education sub disciplinary conceptual knowledge variable aesthetic experience (ATS).

Table 1: Gender wise Classification based on Aesthetic Experiences (ATS)

Gender		Classification based on Aesthetic Experiences (ATS)			Total
		Below Average	Average	Above Average	
Male	Count	96	248	28	372
	% within Males	25.8%	66.7%	7.5%	100.0%
Female	Count	29	123	20	172
	% within Females	16.9%	71.5%	11.6%	100.0%
Total	Count	125	371	48	544
	% within Total	23.0%	68.2%	8.8%	100.0%

Chi-Square = 6.743, $df = 2$, $p = 0.034$

A chi-square test of independence was performed to examine the relation between genders. The relation between these variables was significant, $\chi^2(2, N = 544) = 6.743$, $p = 0.034$. It further shows that aesthetic experiences (ATS) and gender are related, female PETE students were having more knowledge in aesthetic experiences than male counterparts. Percentage of female students belonging to above average (11.6%) and average group (71.5%) are higher than the male students belonging to the respective groups.

Biomechanics is the sport science field that applies the laws of mechanics and physics to human performance, in order to gain a greater understanding of performance in athletic events through modelling, simulation and measurement. The items on which examinees performed well addressed concepts relating to net forces and torques, balance and spin, equilibrium, moment arm length's role in resistance forces,

safe lifting practices, and correct weight lifting and spotting techniques. Some biomechanics items on which examinees did not perform well represented the concepts of buoyancy, the influence of projection height and angle of flight time, and the influence of projection speed in horizontal distance. To assess the sub disciplinary component biomechanics, 20 numbers of questions were included in the tool which comprises of 120 questions. The maximum score that a respondent can have been 20.

An independent sample “t” test was performed for comparing the mean consistency scores of PETE students on physical education sub disciplinary conceptual knowledge – Biomechanics. There was no significant difference found between mean scores between male students (M=8.65, SD=3.25) and female students (M= 8.50, SD=3.10) in Biomechanics; $t(542) = 0.501$, $p < 0.617$. These results show that, there was no significant difference exists between the groups in the physical education sub disciplinary conceptual knowledge variable Biomechanics (BOM).

Table 2: Gender wise Classification based on Biomechanics (BOM)

Gender		Classification based on Biomechanics (BOM)			Total
		Below Average	Average	Above Average	
Male	Count	67	292	13	372
	% Within Male	18.0%	78.5%	3.5%	100.0%
Female	Count	31	138	3	172
	% Within Female	18.0%	80.2%	1.7%	100.0%
Total	Count	98	430	16	544
	% Within Total	18.0%	79.0%	2.9%	100.0%

Chi-Square = 1.270, df = 2, $p = 0.530$

A chi-square test of independence was performed to examine the relation between gender and Biomechanics score level.

The relation between these attributes was not significant, $\chi^2(2, N = 544) = 1.270$, $p = 0.530$. It shows that knowledge in biomechanics (BOM) and gender are not related. This indicates that the ability of a PETE student has no connection with his or her gender as far as knowledge in biomechanics (BOM) is considered.

Exercise physiology (EXP) is the study of how the body reacts to physical exercise, in both the long and short term, and how the body adapts to on-going exercise and any changes to a routine. The 20 items on which examinees performed well addressed concepts including the: (a) FITT principle, (b) role of social and personal influences on attitudes about participating in regular, vigorous activity, (c) factors related to individual strength program design, (d) potentially harmful aspects of exercise, and (e) similarities between arm and leg muscles, joints, and range of motion. To assess the sub disciplinary component 20 numbers of questions were included in the tool which comprises of 120 questions. The maximum score that a respondent can have been 20.

An independent samples t-test was conducted to compare the physical education sub disciplinary knowledge in exercise physiology between genders. There was no significant difference found between in mean scores of males (M=9.78, SD =4.50) and female (M=10, SD=4.69); $t(542) = -.518$, $p = 0.605$. Hence, it can be concluded that the average Exercise Physiology score for males and females among PETE students are not significantly different at the 5% level of significance.

Table 3. Gender wise Classification based on Exercise Physiology (EXP)

Gender		Classification based on Exercise Physiology (EXP)			Total
		Below Average	Average	Above Average	
Male	Count	81	227	64	372
	% Within Male	21.8%	61.0%	17.2%	100.0%
Female	Count	41	95	36	172
	% Within Female	23.8%	55.2%	20.9%	100.0%
Total	Count	122	322	100	544
	% Within Total	22.4%	59.2%	18.4%	100.0%

Chi- Square = 77, df=2, $p = 0.411$

A chi-square test of independence was performed to examine the relation between gender and Exercise Physiology score level. The relation between these variables was not significant, $\chi^2(2, N = 544) = 1.777$, $p = 0.411$. It shows that conceptual knowledge in subdiscipline Exercise Physiology and gender is not related. This indicates that the ability of a PETE student has no relation to his or her gender as far as knowledge in Exercise Physiology (EXP) is considered.

Historical perspective deals with the respondents' knowledge about the history of physical education, sports, exercise, and recreation. It also measures the respondents' knowledge in these areas. It helps them in better understanding of physical education, sport, and exercise, and various aspects of recreation. The historical perspectives, concepts include the: (a) areas of recent emphasis in physical education, (b) role of political events in Olympic history, (c) value of understanding physical education and sports' purpose for diversity and openness, (d) historical source of many games and sports, and (e) current health-related fitness emphasis in physical education curricula, (f) concepts of societal influences on sports rules, (g) historical physical education content and origins, and the (h) role of research in exercise. To assess the sub disciplinary component 15 number of questions were included in the tool which comprises of 120 questions. The maximum score that a respondent can have this subdiscipline was 15.

An independent samples t-test was conducted to compare the physical education sub disciplinary knowledge in historical perspectives between genders. A significant difference was found between the mean scores for female students (M=6.69, SD =2.84) and male students (M=5.98, SD=2.71); $t(542) = 2.777$, $p = 0.006$. These results suggest that female PETE students have a higher level of knowledge in historical perspectives compare to male students.

Table 4: Gender wise Classification based on Historical Perspectives (HIS)

Gender		Classification based on Historical Perspectives (HIS)			Total
		Below Average	Average	Above Average	
Male	Count	74	249	49	372
	% Within Male	19.9%	66.9%	13.2%	100.0%
Female	Count	29	113	30	172
	% Within Female	16.9%	65.7%	17.4%	100.0%
Total	Count	103	362	79	544
	% Within Total	18.9%	66.5%	14.5%	100.0%

Chi-Square = 2.075, df = 2, $p = 0.354$

From table 4., it can be seen that, chi-square test of independence performed to examine the existence of relation between course of study and the conceptual knowledge in historical perspectives. The relation between these attributes was not significant, χ^2 (5, N = 544) = 2.075, $p = 0.354$. Among the male PETE students, 19.9% belong to the below average category, 66.9% with average group and 13.2% in the above average group. In the case of female students, 16.9% with below average category, 65.7% belong to average group and 17.4% amid of above average set.

Motor development (MDT) refers to changes in children's ability to control their body's movements, from infants' first spontaneous waving and kicking movements to the adaptive control of reaching, locomotion, and complex sport skills" (Adolph, Weise, and Marin 2003., 132). The motor development concepts, including: (a) motor development's sequential and developmental properties, (b) the speed of peoples' progress through developmental stages, (c) individually differing skill levels, (d) the role of regular physical activity in age-related diseases, (e) the benefits of game play, (f) the relationship between form and results when combining several skills, (g) the relationship between maturity and the development of cognitive and motor skills, (h) how physical differences contribute to one's motor ability potential, (i) the presence of individuals' cognitive skills across different physical activity settings, (j) the relationship between regular, vigorous activity and fitness, (k) the value of various movement settings in motor performance improvement, and (l) the need to participate in a variety of activities to maintain a high level of function throughout life (m) best develop a new, complex skill and (n) develop game strategies. To assess this sub disciplinary component 15 number of questions were included in the tool and the maximum score that a respondent can have is 15.

The average score for ASK-PE subdiscipline Motor Development (MDT) was 6.88 (SD = 3.166). The average mean score was only 45.87% of a maximum possible score on this domain. Those respondents who scored up to 4 were classified as below average and those who scored from 5 to 10 were classified as average and those who scored above 10 were classified as above average with regard to their knowledge in Motor Development. The mean score of 372 males' students was 6.62 (SD = 3.14) and 7.45 (SD = 3.14) among female students. An independent samples t-test was conducted to compare the physical education sub disciplinary knowledge in motor development between genders. A significant difference was found between mean scores of female students and male students; $t(542) = 2.880$, $p = 0.004$. These results suggest that female PETE students having a higher level of knowledge in motor development compare to male students.

Table 5: Gender wise Classification based on Motor Development (MDT)

Gender		Classification based on Motor Development (MDT)			Total
		Below Average	Average	Above Average	
Male	Count	112	209	51	372
	% within Male	30.1%	56.2%	13.7%	100.0%
Female	Count	40	96	36	172
	% within Female	23.3%	55.8%	20.9%	100.0%
Total	Count	152	305	87	544
	% within Total	27.9%	56.1%	16.0%	100.0%

Chi-Square = 5.813, df, 2, $p = 0.055$

Table 5., gives the results of chi-square test of independence performed to examine the existence of the relation between gender and the conceptual knowledge in motor development (MDT). The relation between this variable was not significant, χ^2 (5, N = 544) = 5.813, $p = 0.055$. Among the male PETE students, 30.1% belong to the below average category, 56.2% in the average group and 13.7% in the above average group. In the case of female students, 23.3% with below average category, 56.1% belong to average group and 20.9% within of above average set.

Motor learning (MLG) has been defined as a "set of internal processes associated with practice or experience leading to relatively permanent changes in the capability for skilled behaviour" (Schmidt RA., 1988). In other words, motor learning is when complex processes in the brain occur in response to practice or experience of a certain skill resulting in changes in the central nervous system that allow for production of a new motor skill. The concepts of motor learning includes : (a) the role of training programs (e.g., flexibility, strength, cardiovascular) on skill improvement, (b) foci during different learning stages (e.g., motor or automatic stages), (c) the role of amount of practice in skill acquisition, and (d) attention and motivation's influence on skill performance, (e) skill transfer, (f) foci during different stages of learning, (g) the role of whole skill versus partial skill on performance, (h) the role of attention on skill performance (also an area of strength for examinees), and (i) the impact of speed versus accuracy practice on skill performance. To assess the sub disciplinary component 15 numbers of questions were included in the tool which comprises of 120 questions. The maximum score that a respondent can have is 15.

The mean score of 372 males were 5.48 (SD = 2.37) and it was 5.90 (SD = 2.09) for females, which is equal to the 36.53% in the case of male and 39.33% female. The "t" test result regarding the equality of mean score of males and females, the t-test for equality of means give a t-value of -1.977 ($p = 0.049$). Hence, it can be concluded that the average ASK-PE subdiscipline Motor Development score for males and females are significantly differing at 5% level of significance.

An independent sample "t" test was performed for comparing the mean consistency scores of PETE students on physical education sub disciplinary conceptual knowledge – Motor Learning. There was a significant difference found between mean scores between male students ($M=5.48$, $SD=2.37$) and female students ($M= 5.90$, $SD=2.09$) in motor learning; $t(542) = 1.977$, $p < 0.049$. These results show that, there were significant differences exist between the groups in the physical education sub disciplinary conceptual knowledge variable Motor Learning (MLG).

Table 6: Gender wise Classification based on Motor Learning (MLG)

Gender		Classification based on Motor Learning (MLG)			Total
		Below Average	Average	Above Average	
Male	Count	208	84	80	372
	% Within Male	55.9%	22.6%	21.5%	100.0%
Female	Count	74	59	39	172
	% Within Female	43.0%	34.3%	22.7%	100.0%
Total	Count	282	143	119	544
	% Within Total	51.8%	26.3%	21.9%	100.0%

Chi-Square = 9.992, df 2, $p = 0.007$

From table 6., it can be seen that, chi-square test of independence was performed to examine the existence of relation between course of study and the conceptual knowledge in motor learning (MLG). The relation between these variables was significant, $\chi^2 (5, N = 544) = 9.992, p = 0.007$. Among the male PETE students, 55.9% belong to the below average category, 22.6% with average group and 21.5% in the company of the above average group. In the case of female students, 43% with below average category, 34.3% belong to average group and 22.7% are of above average set. Social psychology (PSY) is the scientific study of how people's thoughts, feelings, and behaviours are influenced by the actual, imagined, or implied presence of others (Social psychology, 2021). Imagined and implied presences refer to the internalized social norms that humans are influenced by even when alone (Allport, G.W., 1985) [1]. That is, how people's behaviours, thoughts, and feelings change because of other people. In Social Psychology addressed the following concepts: (a) physical activity's role in self-expression, (b) success from using strategies to succeed in movement challenges (e.g., visualization), (c) the benefit of being challenged with difficult but attainable tasks, (d) value of selecting appropriate learning styles to accomplish goals, (e) value of challenging and culturally diverse physical activities and sports, (f) benefits of ethical decision making, (g) value of setting and achieving goals, (h) benefits of distributed leadership, (i) benefits of recording specific feedback regarding performance, (j) value of including student- created

activities in classes, (k) inclusion, (l) value of community service and cross-age projects involving physical activity, (m) interaction skills, (n) factors influencing decisions to pursue regular physical activity, and (o) value of a willingness to learn about others, (p) the concepts of ethical decision making, (q) the value of working independently, (r) showing genuine interest in others, (s) developing understanding and (t) openness toward others. To assess this sub disciplinary component 25 numbers of questions were included in the tool. The maximum score that a respondent can have been 25.

The mean score of 372 males is 9.99 (SD = 4.76) and it is 10.74 (SD = 4.36) for females. Levene's test shows that the variances of the variable Social Psychology for males and females are equal ($F = 1.059, p = 0.304$), t-test for equality of means give a t-value of -1.752 with a p value of 0.080. Hence, it may be concluded that the average Social Psychology score for males and females are not significantly different at the 5% level of significance. An independent samples t-test was conducted to compare the physical education sub disciplinary knowledge in Social Psychology between genders. No significant difference was found between the mean scores for female students ($M = 10.74, SD = 4.36$) and male students ($M = 9.99, SD = 4.76$); $t(542) = -1.752, p = 0.080$. These results suggest that there were no significant differences in Social Psychology knowledge between female and male students.

Table 7: Gender wise Classification based on Social Psychology (PSY)

Gender		Classification based on Social Psychology (PSY)			Total
		Below Average	Average	Above Average	
Male	Count	76	223	73	372
	% Within Male	20.4%	59.9%	19.6%	100.0%
Female	Count	20	113	39	172
	% Within Female	11.6%	65.7%	22.7%	100.0%
Total	Count	96	336	112	544
	% Within Total	17.6%	61.8%	20.6%	100.0%

Chi-Square = 6.326, df = 2, p = 0.042

In the Table 7., the value of Chi-Square (χ^2) for the single group is 6.326, which is significant at 0.05 level of significance as the p-value is 0.042 that is less than 0.05. Hence, we reject the null hypothesis which says that "All the responses are equally distributed". Thus, it may be concluded that knowledge in social psychology of male and female is not equally likely. In the case of male, 20.4% are belonging to below average category, 59.9% with average group and 19.6% amid of above average set. At the same time, 11.6% of female were in below average set, 65.7% belonging to average category and 22.7% with above average set.

Overall, to assess the physical education conceptual knowledge, tools which comprises of 120 questions was administered. The maximum score that a respondent can have is 120. The average mean score on ASK-PE test of the participants was 52.44 (SD = 17.23). This is equal to the 43.7% of the maximum possible score on conceptual knowledge in a physical education test. The mean score of 372 males were 51.40 (SD = 17.39) and it was 54.67 (SD = 16.71) for 172 females. An independent sample "t" test was performed for comparing the mean consistency scores of PETE students on physical education sub disciplinary conceptual knowledge overall score. There was a significant difference found between mean scores between male students ($M = 51.40, SD = 17.39$) and female students ($M = 54.67,$

$SD = 16.71$) in total score; $t(542) = -2.062, p < 0.04$. These results show that, there were significant differences exist between the groups in ASK-PE total score.

Table 8: Gender wise Classification based on Conceptual Knowledge

		Classification based on Conceptual Knowledge			Total	
		Below Average	Average	Above Average		
Gender	Male	Count	93	211	68	372
		% Within Male	25.0%	56.7%	18.3%	100.0%
	Female	Count	33	104	35	172
		% Within Female	19.2%	60.5%	20.3%	100.0%
Total	Count	126	315	103	544	
	% Within Total	23.2%	57.9%	18.9%	100.0%	

Chi-Square = 2.267, df = 2, p = 0.322

In the Table 8, the value of Chi-Square (χ^2) is 2.267 which is significant at 0.05 level of significance, as the p-value is 0.0322 that is less than 0.05. Hence the null hypothesis was rejected, it may be concluded that in the ASK-PE total test score of male and female were not equally likely. In the case of male, 25.0% are belonging to the below average category, 56.7% with average group and 18.3% in the above average group. At the same time, 19.2% of female were in below average set, 60.5% belonging to average category and 18.9%

with above average set. The effect size according to Cohen's $d = 0.192$, which was less than 0.20 indicates a small effect.

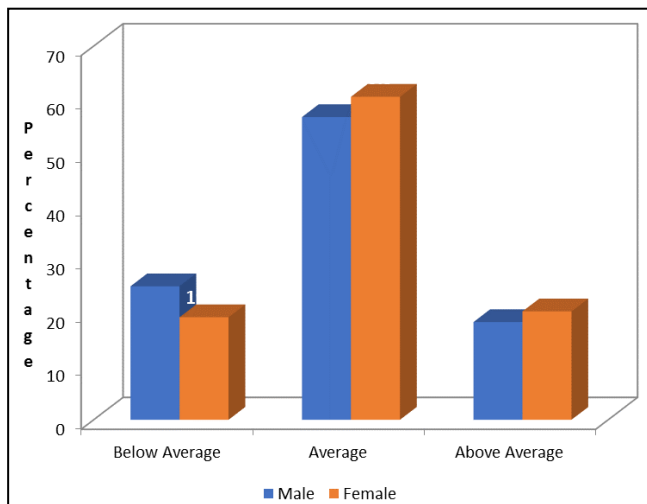


Fig 1: Classification based on Conceptual Knowledge

Discussion

The present study examined the physical education sub disciplinary conceptual knowledge among the PETE students between genders, undergoing various types of courses in the state of Kerala using ASK-PE battery. To assess the sub disciplinary components, ASK-PE test was administered and the average mean score of the participants was 43.7% of the maximum possible score. The ASK-PE tests were developed and initially used to assess a national sample of high school students' physical education conceptual knowledge related to the outcomes described by US national content standards (NASPE, 1995). The low level of the score in ASK-PE test battery clearly indicates substantiated lacuna in physical education teacher education students' conceptual knowledge in the state of Kerala.

The teacher education literature suggests that a strong knowledge of the subject matter taught is a prerequisite to be a competent and effective teacher (Baumert *et al.*, 2010; Belfort & Guimaraes, 2002; Mewborn, 2000; Shulman, 1986, 1987). Teachers' content knowledge affects their pedagogical content knowledge, enters into their teaching processes, and influences their confidence about teaching the subject matter (Kallery & Psillos, 2001). Content knowledge supports lesson structure and acts as a resource in the selection of examples, in the formulation of explanations, and in demonstrations (Leinhardt & Smith, 1985). Physical education researchers (Chen & Ennis, 1995; Hastie & Vlaisavljevic, 1999; Schempp, Manross, Tan, & Fincher, 1998; Siedentop, 2002; Siedentop & Eldar, 1989; Ward, 2009) have recognized the important role that teachers' content knowledge plays in the development and practice of teachers. Scholars point out that physical education teachers with strong subject matter knowledge have a tendency to recognize problems in student learning, accommodate for individuals' skill differences and abilities, exhibit confidence and enthusiasm for teaching, use more learning tasks per lesson, and hold students accountable for quality of performance (Hastie & Vlaisavljevic, 1999; Shempp *et al.*, 1998). Moreover, physical education teachers with strong subject matter expertise included a high level of detail in planning and organizing instruction, designing activities that were more likely to stimulate their students' interest, motivation, and participation, thus decreasing the incidence of off-task behaviour (McKenzie, Sallis, Faucette, Roby, & Kolody, 1993; Placek & Randall, 1986) [21].

Conclusions

According to the findings of this study, it can be concluded that females are having more physical education conceptual knowledge than male physical education teacher education students in the state of Kerala. Ayers (2002) [4] also found that, females scored higher than males on every test. Using criteria identified by Thomas, Lochbaum, Landers and He (1997), the gender effect size was moderate (0.50 - 0.56) on the aesthetics, exercise physiology, motor development, and social psychology tests and negligible to small (0.11-0.36) on the biomechanics, historical perspectives and motor learning tests. In this test also female significantly scored higher in aesthetic experience, historical perspectives, motor development and motor learning.

Kerala has often been referred to as the "land of women". Historically the state has been quite different from the rest of the country in terms of the indicators of women's development. Similarly, in terms of literacy, life expectancy, and mean age at marriage, women in Kerala score better than their counterparts elsewhere in the country. In 1950 when India became a democratic republic, the female literacy rate at the national level was merely 7.9 percent. Kerala's female literacy at the same time was four times higher (32 percent). Thus, historically a favourable ground was set for Kerala women while most of the Indian states were deplorably poor in this regard." (Lakshmi Devi. K.R., 2016). Perhaps these differences may have paved the way for the outstanding achievement of women physical education teacher education students in Kerala in terms of a higher score, and as a result, the increase in the overall development.

Thus, it is critical that PETE curriculum in Kerala need to be partially or entirely restructured to systematically integrate knowledge, skills, and experiences on inclusion issues. Ultimately, this integration will provide sufficient training to future physical educators for inclusion. To thoroughly do this, it will be necessary to employ a sound theoretical model.

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