Japanese Physical Education Preservice Teachers’ Specialized Content Knowledge

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Abstract

The purpose of the study was to investigate the levels of specialized content knowledge (SCK) in volleyball and basketball among preservice teachers (PSTs) in Japan. A total of 689 PSTs (female $n = 258$) participated in the study. Content maps were used to examine the levels of SCK and were analyzed using content development categories and a formula to calculate SCK index scores (Ward et al., 2017). An SCK index score of three was used to differentiate mature and immature levels of SCK. Participants’ playing and teaching/coaching experiences in each sport were collected through a demographic questionnaire. The findings were similar in volleyball and basketball. First, more years of playing experiences helped more PSTs to obtain the mature level of SCK. However, even with more than six years of playing experiences, only less than half (volleyball = 33.33%; basketball = 46.66%) of PSTs scored the mature level SCK. Second, obtaining teaching/coaching experiences helped more PSTs to have the mature level of SCK. Finally, more PSTs who played higher than at the prefecture-level scored the mature level of SCK than PSTs with lower play levels. However, even at the highest playing level category (i.e., the national level or above), less than half of PSTs scored a mature level of SCK. Overall, playing and/or teaching/coaching experiences have some level of positive influence on developing SCK. However, even with those experiences, many PSTs still scored the immature level SCK. Teacher education programs need to be intentional in preparing PSTs to develop SCK.

Keywords: Content knowledge, physical education teacher education, pedagogy
1. Introduction

Content knowledge is a fundamental requirement for quality instruction (Ball et al., 2008; Shulman, 1987; Siedentop, 2002; Ward, 2009). A teacher may know how to manage students or how to instruct them; however, if the teacher does not know the content that they teach, he/she cannot deliver developmentally appropriate sequenced tasks using appropriate cues and feedback to facilitate student learning. Ball and colleagues (2008) described content knowledge consisting of two sub-domains: common content knowledge (CCK) and specialized content knowledge (SCK). CCK is defined as the knowledge and skills that one needs to perform a task. SCK is defined as the knowledge and skills that represent how to teach. Ward (2009) defined CCK and SCK in physical education. CCK includes knowledge of the rules, etiquette and safety, as well as the technique, and if relevant, the tactics of an activity. SCK is defined as knowledge of how to represent the content to students, the instructional tasks to be used to help students acquire the content and the types of student errors that are related to performing the instructional tasks.

To examine the causal relationships of these variables, researchers have conducted intervention studies to improve teachers’ content knowledge and examined if teachers’ instruction and student learning altered (Iserbyt, Ward, and Li, 2015a; Iserbyt, Ward, and Martens, 2015b; Sinelnikov et al., 2015; Ward et al., 2014). The studies consistently found that acquisition of more in-depth content knowledge, particularly SCK resulted in improving quality of instruction and student learning (Kim et al., 2018). This line of the literature shows that knowing SCK to teach is central to effective teaching (Ward and Ayvazo, 2016).

Recently, two studies examined (a) what levels preservice teachers acquire content knowledge (CCK and SCK) through K-12 (elementary school to high school) physical education and extracurricular experiences and (b) if content knowledge (CCK and SCK) can be learned in a teacher education program in the context of the United States (Tsuda et al.,
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2019; Ward et al., 2018). The results showed that while preservice teachers gain a moderate level of CCK through K-12 physical education and extracurricular experiences, they do not acquire SCK in any detail. The studies also showed that learning how to play a sport/activity in college did not help them improve their SCK unless SCK was specifically taught. The studies concluded that teaching SCK during physical education teacher education programs is essential to equip preservice teachers for their future professions (Tsuda et al., 2019; Ward et al., 2018).

The above studies were conducted in the United States, and we know little about preservice teachers’ levels of SCK in Japan. Given the United States and Japanese education and licensure systems are different, examining preservice teachers’ levels of SCK in Japan is important to provide context-specific implication for future curriculum development to determine what need to be taught in teacher education programs. For example, while physical education is taught by a subject-specific teacher from elementary school in the United States, in Japan, physical education is taught by a classroom teacher in elementary school and only from middle school, it is taught by a subject-specific teacher. Similarly, Japan has physical education licensure only for secondary education (middle and high schools), while physical education teachers are licensed from elementary to high school in the United States. Thus, the scope of knowledge that teachers learn during their college years varies between these two countries. In addition, teacher education systems are different in each country. While college students who seek to be licensed need to major physical education teacher education in the United States, students could get licensed with taking required credit hours in specific courses with being in a different major (e.g., sport management or sport coaching) in Japan. As such, education and teacher education systems are different between these two countries. Thus, findings in the United States cannot be translatable in Japanese contexts and a context-specific examination is essential.
The purpose of the study was to investigate the levels of SCK among preservice teachers in Japan. Three research questions guided the study: (a) What are the levels of SCK among preservice teachers (Research question [RQ] 1)? (b) What are the differences in the levels of SCK among preservice teachers who have playing and/or teaching/coaching experiences in a sport (RQ2)? (c) What are the differences in the levels of SCK between preservice teachers who have different playing levels in a sport (RQ3)? We hypothesized for RQ1 that more than 80% of preservice teachers would score the immature levels of SCK. For RQ2, our hypothesis was that more preservice teachers with playing and teaching/coaching experiences would score the mature level of SCK. The RQ3 hypothesis was that more preservice teachers would score the mature level of SCK if their playing level was higher. The results of this study are expected to inform Japanese physical education teacher education curriculum development relative to the acquisition of content knowledge among preservice teachers.

2. Methods

2.1. Settings

The institutional review board of the University of the lead author approved the study (protocol # 1802992954). Informed consent was solicited and obtained from all participants. The cross-sectional research design was used to investigate the research questions. Eight universities (two public universities, three sport/physical education focused private universities, and three private universities) were the sites of the study. Three categories of universities were purposely selected to represent Japanese physical education preservice teachers because different types of the universities use different teacher education programs and have different student populations in Japan. Volleyball and basketball were selected as content areas to measure preservice teachers’ SCK because these are commonly taught content areas in secondary physical education in Japan.

2.2. Subjects
A convenience sampling approach was used to recruit subjects. The research member contacted faculty members of physical education teacher education programs to see if their programs could be the sites of the study. When they agreed, the packets of the study materials including a cover letter, a demographic questionnaire, and a SCK assessment were sent to the sites. Potential subjects read a cover letter and determined if they were willing to be part of the study. A total of 689 preservice teachers (male \( n = 431 \); female \( n = 258 \); \( M_{\text{age}} = 19.61, SD = .82 \)) agreed to participate in the study. Among them, 27 were freshman, 399 were sophomores, 174 were juniors, and 70 were in seniors. The subjects’ home towns were in 31 different prefectures out of 47 in Japan.

2.3. Dependent Variables and Instrument

The participants’ SCK, as well as their playing and/or teaching/coaching experiences in volleyball and basketball, were the dependent variables of the study. SCK was measured using a content map. Playing and teaching/coaching experiences were acquired through a demographic questionnaire.

2.3.1. Specialized Content Knowledge

2.3.1.1. Instrument

Content maps were used to measure the SCK of participants (the detailed description of content maps can be found in Ward, Lehwald, and Lee, 2015). Content maps have been validated in a number of studies (Tsuda et al., 2019; Ward et al., 2018; Ward et al., 2017). A content map is a graphic organizer of SCK that defines the content that could be taught to students in an instructional unit of a particular duration (e.g., 5, 10, or 20 lessons; Ward et al., 2015). In completing the content map participants first identified the basic skills and/or offense/defense tactics (i.e., CCK) that should be taught in a sport or activity for beginning players and list them horizontally from left to right along the bottom of a blank page. Next, they develop the sequence of instructional tasks that could be used to teach the identified
skills and tactics and indicate them vertically on the sheet from simple to more complex. Connections among the vertical sequences are also diagramed such as when they might combine skills and/or skills and tactics. When finished, a content map provides an overview of the instructional tasks that the participant would teach and the relationships among the tasks. In this study, the video clip (https://www.youtube.com/watch?v=HVvbobVkJLE [2'31 long]) was used to instruct how to write a content map.

Once the content maps were completed the depth of SCK in content maps was analyzed using seven categories of content development defined by Ward et al. (2017), which were modified from Rink’s (2012) four categories (informing [I], extending [E], refining [R], and applying [A]). In addition to Rink’s four categories, Ward and colleagues’ definition included extending applying (EA), refining applying (RA), and applying nongame tasks (AN). Table 1 shows the definitions and examples of each category which are introduced in the previous study (Ward et al., 2017, p. 22). After categorizing each task on the content maps with these categories, a total number of each task type was summed, and a SCK index score was calculated using a formula $\frac{E+R+EA+RA+A}{I}$. The validity, reliability, and concurrent validity of this measure have been previously established in differentiating between weak and strong SCK among teachers (Ward et al., 2017). Ward et al. (2017) found that an SCK index score “3” is a cut-point which distinguishes between weak and strong SCK of teachers. A score three represents content development by a teacher that is three progressions beyond the initial task taught to the students.

[Insert Table 1 here]

2.3.1.2. Content Map Analysis and Reliability

Content maps were coded by two trained researchers. The coders completed the content development coding assessment training manual (Dervent et al., 2016). The training manual includes five phases: (a) Learning definition of the content development variables, (b)
assessing task definitions, (c) learning examples of content development in different sports and skills, (d) assessing content development in specific contexts, and (e) assessing content development in different assessment tools. The coder passed all five phases by meeting the criteria (the criteria for the first four phases = 100%; for the last phase = 95%). After the training, two coders analyzed 30% of the total content map to establish inter-coder reliability. The coders were successfully established 99.59% of agreement.

2.3.2. Demographic Background

A demographic questionnaire consisted of ten questions. The first six questions were about the school year, age, gender, the prefecture of their home towns in, future career goals, affiliated university, and degree program. Four questions asked participants’ playing and teaching/coaching experiences in volleyball and basketball. Specifically, the questions were about the years of playing experiences outside of physical education at schools from elementary to high school, the highest playing levels (city, prefecture, regional, national, or international levels), and the years of teaching/coaching experiences of each sport, respectively.

Regarding the years of playing experiences and teaching/coaching experiences, since there are overlaps between these two background characteristics, participants were categorized into six different groups of experiences. First, playing experiences were categorized into three (no playing experiences, less than five years of experiences, and more than six years of experiences). Within each category, the participants were further categorized based on if they have teaching/coaching experiences or not. Table 2 shows the number of participants for each playing and/or teaching/coaching experience and playing level in volleyball and basketball.

2.4. Procedures

[Insert Table 2 here]
The participants were asked to complete the demographic questionnaire and the content maps for volleyball and basketball at the beginning of the school year in a classroom. The data collectors at each site distributed the packet of the assessments, and the participants were asked to read a cover letter. Once participants agree to be part of the study, the data collector showed the video clip describing how to write a content map. Following these procedures, the participants completed a content map for volleyball and basketball, respectively, and the demographic questionnaire in a classroom. The total time to complete the assessments were approximately 20 to 30 minutes.

2.5. Data Analysis

As the first step of the data analysis, differences among eight sites and three different university categories (i.e., public, sport/physical education focused private, and private universities) were examined using the one-way analysis of variance, and no differences were found in the results. Thus, all the data was analyzed in a combined manner. Data were analyzed only descriptively due to the unequally distributed number of participants in each category of the experiences. The descriptive statistics examined the differences in the levels of SCK among preservice teachers who are in the different school years, who have different years of playing and/or teaching/coaching experiences, and playing levels in volleyball/basketball. The data analyses were conducted using SPSS ver. 24.

3. Results

Table 3 illustrates the mean and median of SCK for each school year, playing and/or teaching/coaching experiences, and playing levels. The following sections of the results report the percentage of the participants who scored higher than the SCK index score of three for each research question.

[Insert Table 3 here]

3.1. School Year and SCK
Figure 1 shows the results of the participants’ percentage who scored below and above the SCK index score three from freshman year to seniors. Even in senior levels, still less than half of the preservice teachers reached the SCK index score three in both volleyball and basketball.

[Insert Figure 1 here]

3.2. Playing and/or Teaching/Coaching Experiences and SCK

Figure 2 and 3 show the results of the participants’ percentage who scored below and above the SCK index score three for each category of years of playing and/or teaching/coaching experiences in volleyball and basketball, respectively. Consistent trends were observed in both volleyball and basketball. First, approximately half the participants who have more than six years of playing experiences have also teaching/coaching experiences, while a small number of the participants who have less than five years of playing experiences have teaching/coaching experiences, with the exception of volleyball with no playing experiences. Second, relative to playing experiences, more years of experience helped more preservice teachers to obtain above the SCK index score three. Lastly, within the same category of years of playing experiences, obtaining teaching/coaching experiences helped preservice teachers to have above the SCK index score three.

[Insert Figure 2 and 3 here]

3.3. Playing Levels and SCK

Figure 4 shows the results of participants’ percentage who scored below and above the SCK index score three for different playing levels. In volleyball, more preservice teachers who played at the state, regional, and higher than national levels were able to score the SCK index score three. For basketball, a similar trend was observed. Overall, some playing levels are needed to acquire SCK but higher playing levels do not promise more preservice teachers to obtain the SCK index score three.
4. Discussion

The purpose of this study was to examine the levels of SCK among preservice teachers in Japan. When preservice teachers enter teacher education programs, only 40.74% of the participants in volleyball and 33.33% of the participants in basketball demonstrated the SCK index score three. This indicates that elementary to high school physical education and extracurricular activities have little to do with the SCK among preservice teachers. This finding is consistent with previous studies conducted in the United States (Tsuda et al., 2019; Ward et al., 2018). This study provides further evidence confirming the finding that learning how to play is not sufficient to develop SCK (Tsuda et al., 2019; Ward et al., 2018), and this was also true in a different education context like Japan.

By the senior years, approximately half of the participants scored an SCK index score of three in both volleyball (41.43%) and basketball (48.57%). However, half of the preservice teachers demonstrated low levels of SCK. The results show that Japanese physical education teacher education programs need to be more intentional in teaching SCK for preservice teachers as previous studies conducted in the United States found that only when SCK is specifically taught, do teachers improve their SCK levels (Kim et al., 2018; Tsuda et al. 2019; Ward et al., 2018). In the studies conducted by Tsuda et al. (2019) and Ward et al. (2018), two groups of students who learned how to play a sport and learned how to teach a sport. In these studies, learning how to teach a sport is different from learning instructional strategies and management, which are typically taught in method courses. Preservice teachers learned different tasks and sequenced task progressions in those courses. The results showed that a group of students who learned how to play a sport had no significant improvement in SCK after a semester of learning, a group of students who learned how to teach a sport significantly improved their SCK. It is important to note that the current study did not
examined what types of content and how those content areas were taught in each teacher education program. Thus, future studies should explore the SCK levels of preservice teachers in a variety of content areas with looking at how those content areas are instructed. A linear trend was observed in the results of playing experiences and SCK in volleyball, and a similar tendency was seen in the results in basketball. In each playing experience category, more participants scored above the SCK index score three if the longer playing their experiences with the exception of the participants who had less than five years of playing experiences in basketball. This result illustrates the potential relationship between CCK and SCK. Because CCK is the knowledge that people need to know to perform a sport/activity, and we can expect that people who have longer playing experiences have higher levels of CCK. Thus, if more preservice teachers with longer playing experiences scored the index score three, that would demonstrate potential associations between CCK and SCK. In a previous study conducted in the United States, the associations among CCK, skill performance and SCK were examined in four different content areas including basketball, volleyball, tennis, and badminton (Tsuda et al., 2019). The results showed that there were no consistent associations among these variables. However, a weakness of the study conducted by Tsuda and colleagues was that the CCK measures were only content validated. Further investigation is needed to understand the relationships among these variables using valid and reliable measures in future studies.

Relative to teaching/coaching experiences, more preservice teachers were able to demonstrate an SCK index score above three if they had teaching experiences compared to others who had the same years of playing experiences with no teaching/coaching experiences. This provides further evidence that SCK is critical for teaching/coaching (Ward, 2009). However, we do not know how those preservice teachers who had a SCK index score above three with teaching/coaching acquired the knowledge. Further studies are essential to
understand how Japanese preservice teachers develop SCK. In addition, it is important to note that, while more teachers with teaching/coaching experiences showed the SCK index score three in volleyball than teachers without those experiences, 40% of the participants demonstrated scores below three, which implies that those 40 percent of preservice teachers taught someone without knowing SCK. This is problematic because quality instruction cannot be delivered without adequate SCK levels (Kim et al., 2018; Ward and Ayvazo, 2016).

Among the five different playing levels (i.e., city, prefecture, regional, national and international), the higher the playing levels, the more preservice teachers demonstrated an SCK index score above three with the exception of basketball at the prefecture-level. However, in volleyball, beyond the state playing level, there were no noticeable differences among the number of preservice teachers who scored higher than the SCK index score three. It can be hypothesized that those preservice teachers with higher playing levels were exposed to different types of practice tasks/drills in the past which may have helped them to develop some levels of SCK. Also, these results show that while there are potential associations between playing levels and SCK, obtaining high playing levels may not necessarily demonstrate stronger associations with SCK. Thus, in teacher education programs, it is essential to develop some levels of playing levels because through learning a sport, preservice teachers can also learn different types of tasks and task progressions, but it does not need to be very high to achieve this goal.

Overall, the study found that playing and teaching/coaching experiences have some positive influence on SCK. However, even if the participants were in the same categories of the experiences, not every participant demonstrated the same levels of SCK, either above or below the SCK index score three. Thus, teacher education programs need to be intentional and ensure to prepare every preservice teacher to develop SCK while they are in teacher
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education programs (Kim et al., 2018; Tsuda et al., 2019; Ward et al., 2018). It is also important to note that these small numbers of participants in each playing and teaching/coaching experience illustrate limited preservice teachers’ experiences in a sport/activity prior to entering and during teacher education programs. This study supports the importance of teacher education programs in assisting preservice teachers in acquiring essential knowledge bases in different content areas.

There are four limitations to this study. First, we used a convenience sample. It is possible that a random sample would reveal different results. Second, an unequal number of participants were recruited for each year of preservice teachers, which allowed us to utilize only descriptive statistics. To understand the associations between SCK and demographic background, having more equivalent numbers of participants in each school year would be ideal. Third, there were approximately 25 to 30 people in each category of playing and/or teaching/coaching experiences. Increasing the total number of participants could add to the number of participants in each category. Finally, the knowledge of tasks and task sequences aspects of SCK was measured in this study while the knowledge of student errors is another element in SCK. Future studies should assess preservice teachers’ overall knowledge levels of SCK to further explore this knowledge area.

5. Conclusions

This was the first study conducted to measure preservice teachers SCK in the context of Japan. The results showed that there are some positive influences of playing and teaching/coaching experiences on SCK; however, not every participant had the same impact on their SCK from these experiences. This finding was consistent with the results found in the United States (Tsuda et al., 2019; Ward et al., 2018). Thus, teacher training programs need to be intentional in their teaching of SCK. In conclusion; (a) SCK is not be developed through physical education or extracurricular activities in K-12 schooling, and (b) teacher
education programs are not developing SCK sufficiently. There is evidence from studies in
the United States that when SCK is adequately taught, preservice teachers can develop SCK
(Tsuda et al., 2019; Ward et al., 2018).

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Membership in Learned Societies:
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Table 1

The definitions and examples of content development variables (Ward, Dervent, Lee, Ko, Kim, & Tao, 2017, p.22)

| Categories                      | Definitions and Examples                                                                 |
|---------------------------------|------------------------------------------------------------------------------------------|
| Informing task (I)              | The initial task in the progression of a skill and which cannot be classified under the other categories. For example, “Let’s start with partner toss and pass.” |
| Extending task (E)              | A task that increases the level of difficulty of a previous task by adding elements (e.g., part to whole), changing or adding a new dimension (e.g., distance, space, speed, target area) or adding more variety (e.g., asking students to move in a different way). For example, “Let’s make this more difficult by moving the cones closer in our 3v1.” |
| Extending Application task (EA) | An extending task occurring in context of a game-like environment where the purpose is to apply the task in a game. For example, “In this 3v3 game let’s turn the defense from passive to active.” |
| Refining task (R)               | A task that requires a specific focus on the quality of performance such as technique or tactical performance. For example, “Remember to focus on following through with your foot once you pass the ball.” |
| Refining Application task (RA)  | A refining task occurring in context of a game-like environment where the purpose is to apply the ask in a game. For example, “In this 3v3 game, make sure to run an open space before receiving the pass.” |
| Applying Nongame task (AG)      | A task that centers on assessment of form or on how to use the movement, rather than just how to do the movement. For example, “How many times can you catch the ball without dropping it.” |
| Applying task-game (AG)         | A task that uses the content of the lesson in a game. For which the particular focus is not specified. For example, “Let’s play 3v3 game.” |
Table 2

The number of participants in each playing and/or teaching/coaching experiences in volleyball and basketball

| Play & Teach/Coach Experiences | Volleyball (n) | Basketball (n) |
|--------------------------------|---------------|---------------|
| **Play Years**                  |               |               |
| N/A                            | No            | 571           | 552           |
|                                | Yes           | 31            | 3             |
| Less than 5 years              | No            | 30            | 58            |
|                                | Yes           | 5             | 3             |
| More than 6 years              | No            | 27            | 45            |
|                                | Yes           | 25            | 28            |
| **Play Levels**                |               |               |
| N/A                            |               | 608           | 574           |
| City                           |               | 17            | 33            |
| Prefecture                     |               | 29            | 40            |
| Regional                       |               | 16            | 25            |
| National <                     |               | 19            | 16            |

Note. N/A = Not applicable. National < = The national and international playing levels.
Table 3
Descriptive statistics of the participants’ SCK in different background experiences in volleyball and basketball

|                      | Volleyball |                      | Basketball |                      |
|----------------------|------------|----------------------|------------|----------------------|
|                      | Mean (SD)  | Medium (range)       | Mean (SD)  | Medium (range)       |
| **School Year**      |            |                      |            |                      |
| Freshman             | 1.89 (1.30)| 2.00 (0-5)           | 1.73 (1.41)| 1.67 (0-5)           |
| Sophomore            | .97 (1.50) | .00 (0-15)           | 1.05 (1.51)| .00 (0-10)           |
| Junior               | 1.84 (1.30)| 1.67 (0-7)           | 2.08 (1.69)| 2.00 (0-12)          |
| Senior               | 2.02 (.96)| 2.10 (0-5)           | 2.50 (1.62)| 2.33 (0-5)           |
| **Play and/or Teach/Coach Experiences** | | | | |
| N/A                  |            |                      |            |                      |
| No                   | 1.25 (1.44)| 1.00 (0-15)          | 1.39 (1.58)| 1.25 (0-12)          |
| Yes                  | 1.77 (1.15)| 1.80 (0-5)           | -a         | -a                   |
| Less than 5 years    |            |                      |            |                      |
| No                   | 1.68 (1.34)| 1.88 (0-5)           | 1.29 (1.56)| .63 (0-7)            |
| Yes                  | -a         | -a                   | -a         | -a                   |
| More than 6 years    |            |                      |            |                      |
| No                   | 1.45 (1.65)| 1.25 (0-6)           | 2.11 (1.66)| 2.00 (0-7)           |
| Yes                  | 2.39 (1.61)| 2.50 (0-5)           | 3.04 (1.63)| 3.50 (0-7)           |
| **Play Levels**      |            |                      |            |                      |
| N/A                  | 1.27 (1.42)| 1.0 (0-15)           | 1.41 (1.58)| 1.25 (0-12)          |
| City                 | 1.88 (1.56)| 1.67 (0-5)           | 1.90 (1.98)| 1.67 (0-7)           |
| Prefecture           | 2.06 (1.62)| 2.20 (0-5)           | 2.36 (1.80)| 2.73 (0-7)           |
| Regional             | 1.71 (1.75)| 1.54 (0-6)           | 1.86 (1.44)| 2.00 (0-4)           |
| National <           | 1.74 (1.69)| 2.00 (0-4)           | 1.74 (1.63)| 1.96 (0-5)           |

Note. N/A = Not applicable. National < = The national and international playing levels. a = Data are not presented since there were five or less participants fit into this category.
Specialized Content Knowledge among Preservice Teachers

Note. Freshman $n = 27$; sophomore $n = 399$; junior $n = 174$; senior $n = 70$.

Figure 1. The percentage of the participants who scored below and above the SCK index score three from freshman to senior years.
Note. N/A = Neither playing or teaching/coaching experiences.
No = No teaching/coaching experiences. Yes = Both playing and teaching/coaching experiences.
Sample size: N/A n = 602 (No = 571; Yes = 31); Less than 5 years n = 35 (No = 30; Yes = 5); More than 6 years n = 52 (No = 27; Yes = 25).
*Since n was too small in the categories of “Less than 5 years – Yes,” the results are not included in the figure.

**Figure 2.** The percentage of the participants who score below and above the SCK index score three for each category of years of playing experiences and/or teaching/coaching experiences in volleyball.
Specialized Content Knowledge among Preservice Teachers

Note. N/A = Neither playing or teaching/coaching experiences. No = No teaching/coaching experiences. Yes = Both playing and teaching/coaching experiences. Sample size: N/A n = 555 (No = 552; Yes = 3); Less than 5 years n = 61 (No = 58; Yes = 3); More than 6 years n = 73 (No = 45; Yes = 28).
*Since n was too small in the categories of “N/A – Yes” and “Less than 5 years – Yes,” the results are not included in the figure.

**Figure 3.** The percentage of the participants who score below and above the SCK index score three for each category of years of playing experiences and/or teaching/coaching experiences in basketball.
Note. Volleyball (N/A \( n = 608 \); city \( n = 17 \); Prefecture \( n = 29 \); regional \( n = 16 \); national and international \( n = 19 \)). Basketball (N/A \( n = 574 \); city \( n = 33 \); Prefecture \( n = 40 \); regional \( n = 25 \); national and international \( n = 16 \)).

**Figure 4.** The percentage of the participants who score below and above the SCK index score 3 for each category of playing levels in volleyball and basketball.