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Article · July 2021

DOI: 10.22271/yogic.2021.v6.i2c.1235

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ISSN: 2456-4419

Impact Factor: (RJIF): 5.18

Yoga 2021; 6(2): 135-140

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www.theyogicjournal.com

Received: 19-07-2021

Accepted: 10-09-2021

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Teachers' utilization of instructional cues: types, targets and rate per minute in physical education setting

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DOI: <https://doi.org/10.22271/yogic.2021.v6.i2c.1235>

Abstract

Instructional cue (IC) plays an important role in directing student's attention toward the most critical information about a movement task. Notably, an incorrect performance of a skill practiced for a long period is difficult to correct later. For this reason, physical education (PE) teachers need to constantly develop and implement good strategies that enhance students' acquisition of critical features of movement skills. Teachers must use a variety of ICs targeted fairly at individual students and whole class. For effectiveness, different types of teachers' ICs must be provided in an instructional setting. However, little is known about the effectiveness of teachers' ICs in practical PE setting. The purpose of this pedagogical research in PE setting was to investigate targets, types and rate per minute of teachers' ICs in netball shooting skill. The study was situated in three selected colleges of education (CoE) where descriptive processes were used to conduct the investigation. Digital video was utilized to record naturally occurring classroom events of pre-service teachers (n=77) and PE teachers (n=4). The video-recorded lesson lasted 1 hour (60 minutes). Two independent recorders used event recording instrument to document classroom events relating to types and targets of teachers' ICs. Inter-observer agreement procedures revealed a good reliability of data collected for the study. Descriptive analyses were conducted using mainly percentages, frequencies and means. Major findings of the study showed that verbal, visual and kinesthetic ICs were the main types of Teachers' ICs used during the instructional period. However, verbal ICs dominated the observed practical lesson. Findings also revealed that more verbal ICs were provided to the group than individual students. Non-verbal ICs which involved demonstrations and signals were mostly used to facilitate individual students' acquisition of the shooting skill in netball. In each minute, students received teachers' IC relating to the proper technique of performing assigned task.

Keywords: Instructional cues (IC), Verbal instructional cue (VIC), Non-verbal instructional cues (NVIC), Instruction

1. Introduction

Typically, PE teachers regularly deliver external source of information to facilitate students' acquisition of skill during lesson delivery. As acknowledged by Raisbeck and Yamada (2019)^[1] "external focus instructions specific to performance are beneficial for performance" (149) and that "the benefits of using an external focus instruction are robust" (p.150). However, Becker and Fairbrother (2019)^[2] indicate that "external focus cues are not frequently adopted in applied sport setting" (p.651). Most often, teaching cues focus on motor skill development. However, teaching cues in PE setting may also target fitness, character development, or any other aspect of a lesson that a teacher considers appropriate. In most practical PE settings, the PE teacher assumes responsibilities of all best instructional practices in a way that facilitates learning. By so doing, the teacher provides relevant instructional information that relates to the movement task being executed. The teacher offers suggestions to enable students perform well and achieve maximum outcome of the instructional goal. Literature demonstrates that teachers typically provide suggestions on students' work as the most meaningful way that can influence learning outcome (Hatfield and Timperley, 2007)^[5].

1.1 Types of ICs

In practical PE setting, the instructional effectiveness of a teacher depends largely on how the teacher uses ICs. A cue consists of a word, phrase, or sentence that describes critical elements involved in performing a task successfully. Pangrazi and Beighle (2019)^[9] see a teaching cue as a word or a phrase that calls attention to the key points of skill technique. A growing body of research (e.g. Alpizar, *et al.* 2020; Hurzlmeler, *et al.*, 2021; Mayer, 2014; Raisbeck & Yamada, 2019; Schneider *et al.*, 2018)^[1, 8, 11, 13] suggests that ICs enhance skill acquisition by improving students' attention, comprehension and retention. Not only should learners be provided with practice exercises, they should be given ICs to help them perform better in an instructional environment.

1.1.1 Verbal Cues

The largest quantity of information in every instructional environment is communicated verbally. As a result, verbal ICs are most widely used in PE setting. In addition, verbal information is not easily misunderstood if the expression is clear to the students. Pufaa (2006) argues that learners should be helped to establish an image of the task or skill through verbal instructions provided by the teacher. However, the teacher may over-use instructions when faced with the task of describing a complex movement. Pufaa contends that "The teacher should therefore use verbal cues to help students remember points for skill performance" (p.16) and that a teacher "may overwhelm learners and in an effort to cope with the avalanche of information about what to do and when to do it, may disregard much of the information" (p.33). In an instructional setting where language barrier exists, verbal cues are rendered less valuable. This situation presents a challenge to the teacher to use non-verbal means to help students acquire critical elements of the skill being taught.

1.1.2 Non-Verbal Cues (visual and kinesthetic cues)

The two main non-verbal ICs are the visual and kinesthetic ICs. Pufaa (2006) explains that "Kinesthesia deals with motion or movement that is connected with the ability to sense body position through the sensory organs located in the muscles, tendons and joints". Pufaa explains further that kinesthetic involves "the sensation of position or the control of motor performance" (p.47). Visual and kinesthetic cues are helpful to all learners of a new skill. In addition, visual and kinesthetic cues are especially appropriate when verbal cues have limited value. Klein *et al.* (2019)^[7] reported that "visual cues can be beneficial in coordination tasks, even for students with high domain knowledge" (p.1). Highlighting the potential benefit of teacher's visual cues to students with low skill level, it is noted that "For learners with low prior knowledge, visual cues offer additional support, providing lacking information and guiding learners through complex tasks" (Hurzlmeler, *et al.*, 2021, p.9). Sometimes, it is helpful to utilize visual demonstrations or 'physical manipulation' to convey movement ideas. As demonstrated above, visual and kinesthetic cues are also used widely in instructional setting involving practical lessons.

For variety, different types of teachers' ICs should be provided in an instructional setting. These teaching cues must be targeted fairly at groups and individual students. However, little is known about the effectiveness of how teachers' ICs are administered in practical instructional setting in PE. For this study, our main purpose was to investigate:

1. Types of Teachers' ICs in a practical netball shooting skill,

2. Teachers' target of ICs, and
3. Rate per minute of teachers' ICs in 60 minutes practical lesson period.

2. Methods

2.1 Participants

Participants were pre-service teachers (males=28, females=53) drawn from first year group and regular PE teachers (n=4). All subjects for the study were drawn from three educational institutions. Participants were assigned different roles. As part of inclusion criteria, pre-service teachers used for the study were those that had not previously participated in competitive netball activities (novice shooters in netball). This was particularly important in determining the influence of teachers' IC on shooting skill using two instructional schedules (with teachers' IC & without teachers' IC). Table 1 specifies the composition of subjects involved in the study.

Table 2: Study Participants

Gender	Group A	Group B	Group C	Total	Percent. (%)
Male	4	2	22	28	35
Female	0	30	23	53	65
Total	4	32	45	81	100

Groups of Study Participants	
Group A:	Indicates the number of PE teachers whose mandate was to use ICs in teaching shooting skill to pre-service teachers.
Group B:	Indicates the number of pre-service teachers used in the 30 minutes lesson for each of the two observed classes.
Group C:	Indicates the number of pre-service teachers used in the two schedules of teaching (with IC and without IC) a shooting task to determine the effects of IC on shooting.

2.2 Procedures

Data were collected in natural practical PE setting where students and two PE teachers engaged in teaching a practical lesson involving netball shooting skill. All student participants were drawn from homogeneous group who were at the beginning phase of learning to shoot in netball. Prior to data collection, there was brief orientation for research assistants and the PE teachers involved in the study. The lesson was video recorded in natural instructional setting. Two independent recorders observed the video-recorded lesson and documented types and targets of teachers' ICs. Data were analysed objectively, establishing inter-observer reliability between the two recorders. Frequencies, means, percentages, and rate per minute of events were generated from the inter-observer recordings. In cases of disagreement during event recording, literature establishes that "The two (or more) observers can then discuss discrepancies and resolve them" (Siedentop & Tannehill, 2000, p.335)^[14]. This information provided support for the two independent observers to resolve disagreements in an objective and unbiased manner.

3. Analyses

Data analyses were based on inter-observer evaluation of events relating to types and targets of teachers' ICs which were video-recorded during the practical lesson. Inter-observer agreement was used to test the reliability of data for

making research decisions. The process yielded $\geq 80\%$ agreement between the two independent recorders which indicated a good reliability of data in each category of instructional event investigated. This is in line with literature which reports that “A reliability of 80 percent is usually considered necessary for research purposes” (Siedentop, & Tannehill, 2000, p.338) [14]. Types and target of teacher’s ICs were converted to rate per minute. This was done conveniently because any instructional behavior of the teacher or student that produces a frequency count of events can be converted into rate per minute.

4. Results

4.1 Target of Teachers’ IC

The frequency count of verbal ICs received by individual students was 19 events for observer one and 16 events for observer two. The two observers recorded a mean score of 17.5 events and data for this category was 84% reliable. For non-verbal ICs targeted at individual students, the first

observer recorded 18 events while the second observer recorded 19 events. A mean score of 18.5 events was obtained from the two observations which yielded 95% data reliability. Moreover, observer one documented 35 frequency count of events for verbal IC targeted at the entire group while 32 events were recorded by the second observer. Mean data for these two observers was 33.5 events and data for this category was 91% reliable. Non-verbal IC provided by the teachers to the group yielded 23 frequency count of events for observer one and 23 for observer two. Mean score for non-verbal IC to the group recorded 23 events with 100% inter-observer agreement for this category. In all, observer one recorded 95 events while observer two recorded 90 events with the two observations yielding a mean score of 92.5 events. Data reliability was 95% for the total recorded events for all categories. Table 2 presents the results on teachers’ target of IC in the practical PE setting involving shooting skill in netball.

Table 2: Teachers’ Target of ICs

Target	Observation				Inter-Observer Agreement	
	Type	Observer1	Observer2	Mean Score	Equation	Percent. (%)
Individual	Verbal IC	19	16	17.5	$\frac{16}{16 + 3} \times 100$	84
	Non-Verbal IC	18	19	18.5	$\frac{18}{18 + 1} \times 100$	95
Group	Verbal IC	35	32	33.5	$\frac{32}{32 + 3} \times 100$	91
	Non-Verbal IC	23	23	23	$\frac{23}{23 + 0} \times 100$	100
Total		95	90	92.5	$\frac{90}{90 + 5} \times 100$	95

4.2 Rate per minute of Teachers’ Target of IC

According to the data, inter-observer frequencies of teachers’ ICs were 17.5, 18.5, 33.5, and 23 events for verbal IC targeted at individual, non-verbal IC targeted at individual, verbal IC targeted at the group, and non-verbal IC targeted at the group respectively. Analysis of data reveals rate per minute of all

categories of IC as 0.29, 0.31, 0.56 and 0.38 for verbal IC (individual), non-verbal IC (individual), verbal IC (group), and non-verbal IC (group) respectively. Overall, teachers’ ICs were provided at the rate of 1.54 per minute. Table 3 presents the results on the rate per minute of teachers’ ICs.

Table 3: Rate per minute of teachers’ Target of ICs [Length of Observation = 1 hour (60 minutes)]

Target	Type of IC	Inter-Observer Score	Equation	Rate Per Minute
Individual	Verbal IC	17.5	$\frac{17.5}{60}$	0.29
	Non-Verbal IC	18.5	$\frac{18.5}{60}$	0.31
Group	Verbal IC	33.5	$\frac{35.5}{60}$	0.56
	Non-Verbal IC	23.0	$\frac{23}{60}$	0.38
Total		92.5	$\frac{92.5}{60}$	1.54

4.3 Order of Magnitude by which Teachers’ ICs were targeted at Students

It was observed that verbal ICs were most frequently targeted at group with 33.5 events, followed by non-verbal IC targeted

at the group (23 events) and subsequently followed by individual IC (17.5 events) and individual non-verbal IC (18.5 events). Figure 1 presents the results on the order of magnitude by which teachers’ ICs were targeted at students.

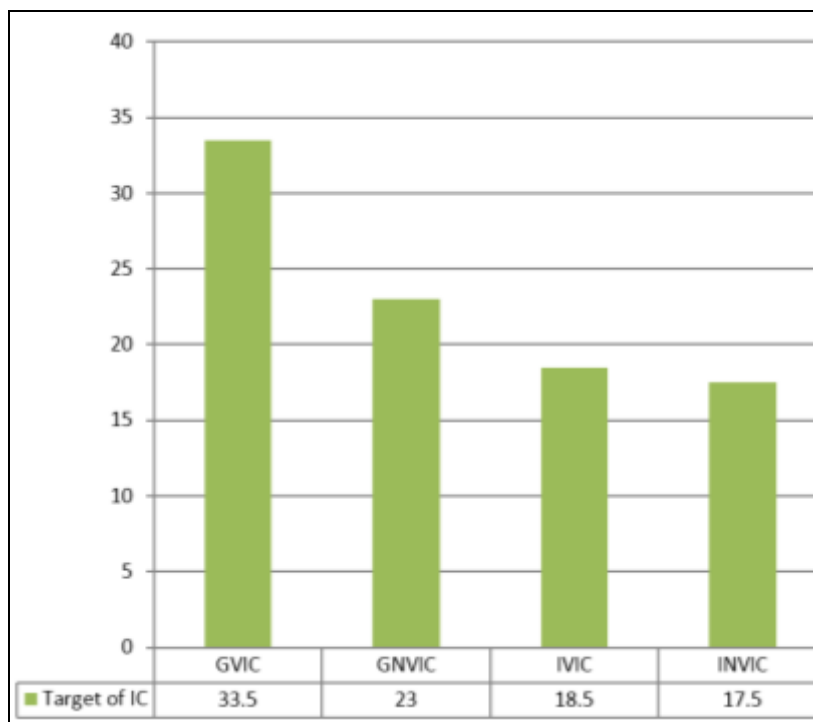


Fig 1: Frequency order by which various IC were targeted at students

Keys

- GVIC:** Group Verbal Instructional Cues – Verbal IC targeted at the whole group (33.5 events)
- GNVIC:** Group Non-verbal Instructional Cues – Non-verbal IC targeted at the whole group (23 events)
- IVIC:** Individual Non-verbal Instructional Cues – Verbal IC targeted at individual students (18.5 events)
- INVIC:** Individual Verbal Instructional Cues – Non-verbal IC targeted at individual students (17.5 events)

4.4 Types of Teachers’ ICs

Data suggested two main identifiable teachers’ ICs (i.e. verbal IC and non-verbal IC). The non-verbal ICs were organized into visual and kinesthetic ICs. Evaluation of data relating to verbal IC shows that there were 58 and 59 frequency count of events for observer one and two respectively. The mean score for the two observers was 58.5 whilst inter-observer data reliability for this category was 98%. For visual IC, observer

one obtained frequency count of 5 events while observer two obtained frequency count of 4 events with inter-observer score of 4.5 and inter-observer data agreement of 98%. Kinesthetic type of IC recorded 36 and 37 events for observer one and two respectively. An inter-observer frequency of 36.5 events was recorded for the kinesthetic type of IC. Table 4 shows data on the types of teachers’ IC in the observed practical lesson.

Table 4: Types of Teachers’ ICs in a Practical PE Setting

Types	Observation			Inter-Observer Agreement	
	Observer 1	Observer 2	Mean Score	Equation	Percent. (%)
Verbal IC	58	59	58.5	$\frac{58}{58 + 1} \times 100$	98
Visual IC	5	4	4.5	$\frac{4}{4 + 1} \times 100$	80
Kinesthetic IC	36	37	36.5	$\frac{36}{36 + 1} \times 100$	97
Total	99	100	99.5	$\frac{99}{99 + 1} \times 100$	99

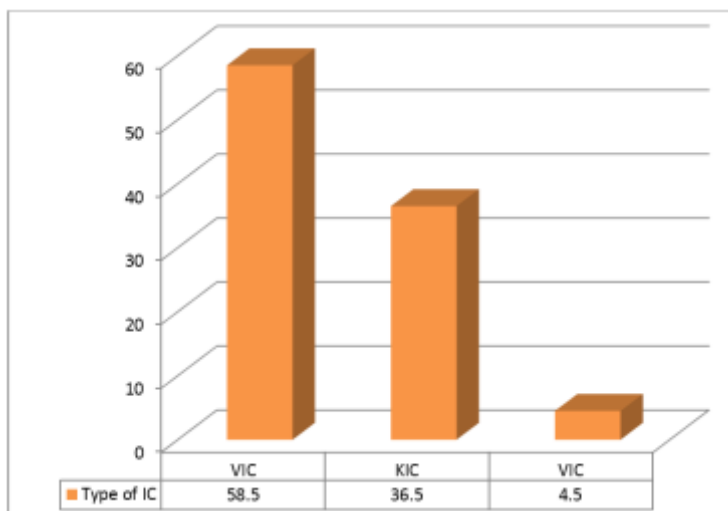
4.5 Rate per Minute of Types of Teachers’ ICs

Analysis of data revealed inter-observer mean score of 99.5 events for all types of Teachers’ IC that occurred at the rate of 1.7 per minute in the 60 minutes length of the observed lesson. Verbal IC achieved inter-observer score of 58.5 events at the rate of 1.0 per minute. For visual IC, inter-observer score of 4.5 events were recorded at the rate of 0.1 per

minute. Kinesthetic IC which was mostly demonstrations recorded 36.5 events as the inter-observer score that happened at the rate of 0.6 per minute. Table 5 presents rate per minute of all types of teachers’ IC in the practical setting involving netball shooting skill, while figure 2 presents the order of magnitude by which the teachers’ IC occurred in a practical instructional setting.

Table 5: Rate per Minute of the Types of Teachers’ ICs

Type	Inter-Observer Score	Equation	Rate Per Minute
Verbal IC	58.5	$\frac{58.5}{60}$	1.0
Visual IC	4.5	$\frac{4.5}{60}$	0.1
Kinesthetic IC	36.5	$\frac{36.5}{60}$	0.6
Total	99.5	$\frac{99.5}{60}$	1.7



Keys

VIC: Verbal Instructional Cues

KIC: Kinesthetic Instructional Cues (e.g. demonstrations)

VIC: Visual Instructional Cues (e.g. signals)

Fig 2: Order of magnitude by which various ICs were provided in practical PE setting

5. Discussion

Findings revealed that verbal, visual and kinesthetic ICs were the main types of teachers’ ICs used during the instructional period. However, verbal IC dominated the entire practical lesson. It was also observed that more verbal ICs were provided to the group than individual students. Again, non-verbal ICs which mostly were demonstrations and signals were provided to individual students more than the entire group or class. Findings based on the results suggested that at each minute, students received teachers’ IC relating to the proper technique of performing assigned skill. This should be deemed ideal in teaching and learning proper techniques of a skill to beginners. Studies suggest that skilled learners are able to disregard irrelevant information and concentrate on critical elements necessary for skill acquisition (Jarodzka *et al.*, 2010). Relatedly, it is also suggested that learners with prior knowledge benefit from instructional support offered by the teacher (Richter, 2016) [12].

Results also suggested a low percentage of visual ICs during lesson delivery. It could be observed that verbal ICs alone were more than visual and kinesthetic type of ICs put together. This situation is not unusual in PE practical setting. Findings revealed a natural phenomenon where the use of visual IC is minimized whilst maximizing verbal and kinesthetic cues to help learners obtain the correct procedures of performing a movement task in a practical PE setting. In their opinion, Becker and Fairbrother (2019) [2] suggest that “coaches often use different cues in search of one that works best with each individual ...” (p.654). Generally, corrective suggestions of the instructor are reported to have influence on learning outcome (Hattie & Timperley, 2007) [5].

In administering non-verbal IC especially those that belong to visual category, coaches or PE teachers are encouraged to give their learners visual guidance. Visual guidance, according to Galligan *et al.* (2000) [3] “involves the transfer of information through the use of demonstrations, video images, visual aids such as posters, modifications of the display, manuals etc” (p.110). Galligan and his associates further state “... it is often difficult to explain complex elements of skill performance and it may be best to use verbal guidance to support visual guidance” (pp. 110-111).

Findings of the study revealed two main non-verbal ICs (i.e. visual IC and kinesthetic IC). Pufaa (2006) explains that “Kinesthesia deals with motion or movement that is connected with the ability to sense body position through the sensory organs located in the muscles, tendons and joints”. This means that “it involves the perception of movement, the sensation of position or the control of motor performance” (p.47). Visual and kinesthetic cues are helpful to all learners for the sake of variety and to visual and kinesthetic learners in particular. In addition, visual and kinesthetic cues are especially appropriate when verbal cues have limited value. An obvious situation that renders verbal cues less valuable is any time a language barrier exists. Another situation in which verbal cues are less valuable is in teaching movements with complex directions. Klein *et al.* (2019) [7], “empirical evidence has shown that external focus cues result in more smoothly coordinated movement” (p.19). Yet, literature reiterates that the external focus instructions should be specific to the subject matter of the instruction and that the primary goal of the task should be to improve performance (Raisbeck & Yamada, 2019) [11]. It is suggested that “For learners with low

prior knowledge, visual cues offer additional support, providing lacking information and guiding learners through complex tasks” (Hurzmeler, *et al.*, 2021, p.9).

6. Conclusions

Naturally, verbal ICs occur more frequently than other types of teachers’ IC in practical PE lessons. Using various types of ICs at the rate of 1.7 per minute in a 60 minute length of observed lesson should be deemed ideal for skill learning. According to the findings, verbal ICs were most frequently used, followed by kinesthetic IC and visual IC which by nature were demonstrations and signals. It is demonstrated beyond doubts that ICs provide relevant information that facilitates the learning of a motor skill in PE practical setting. Teachers’ ICs provide a solution to a motor task problem to save the learner’s time and energy in learning the skill being taught. Teachers’ IC is administrated in order to create a facilitating environment where learning and instruction can take place conveniently. Skill learning demands effective teacher’s IC in a well-planned instructional environment that facilitates effective presentation and practice of subject matter. Learning shooting skill in netball primarily involves movement. For this reason, acquisition of knowledge of the rules and strategy pertaining to the critical skill points involved in performing the skill is necessary.

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8. Conflict of Interest Statement

With respect to this study, we declare that there is no potential conflict of interest in the publication of this article.

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