



Candidates must complete this page and then give this cover and their final version of the extended essay to their supervisor.

Candidate session number

Candidate name

School name

Examination session (May or November)

May

Year

2015

Diploma Programme subject in which this extended essay is registered: Sports, Exercise and Health studies

(For an extended essay in the area of languages, state the language and whether it is group 1 or group 2.)

Title of the extended essay: Which type of feedback, intrinsic, extrinsic or both, has the greatest effect on learning how to serve a volleyball?

### Candidate's declaration

*This declaration must be signed by the candidate; otherwise a mark of zero will be issued.*

The extended essay I am submitting is my own work (apart from guidance allowed by the International Baccalaureate).

I have acknowledged each use of the words, graphics or ideas of another person, whether written, oral or visual.

I am aware that the word limit for all extended essays is 4000 words and that examiners are not required to read beyond this limit.

This is the final version of my extended essay.

Candidate's signature: \_\_\_\_\_

Date: 28/1/2015

## Supervisor's report and declaration

The supervisor must complete this report, sign the declaration and then give the final version of the extended essay, with this cover attached, to the Diploma Programme coordinator.

Name of supervisor (CAPITAL letters) \_\_\_\_\_

Please comment, as appropriate, on the candidate's performance, the context in which the candidate undertook the research for the extended essay, any difficulties encountered and how these were overcome (see page 13 of the extended essay guide). The concluding interview (viva voce) may provide useful information. These comments can help the examiner award a level for criterion K (holistic judgment). Do not comment on any adverse personal circumstances that may have affected the candidate. If the amount of time spent with the candidate was zero, you must explain this, in particular how it was then possible to authenticate the essay as the candidate's own work. You may attach an additional sheet if there is insufficient space here.

's Extended Essay is a satisfactory reflection of her capabilities. Unfortunately she did fail to stick to the pre-arranged schedule of meetings and was not always communicative with me on this.

was slow to finalise a research question and had to dramatically scale down her initial thoughts so that she would be able to carry out the investigation in time but once she did this, she remained on track. did a lot of background research and designed quite an intricate and detailed investigation recruiting the help of her friends as coaches providing feedback. Her reasoned argument was sound yet not entirely balanced.

I think found this process quite challenging, in particular managing the demands of this in terms of time required but produced a sound piece of work in her chosen area of passion.

*This declaration must be signed by the supervisor; otherwise a mark of zero will be issued.*

I have read the final version of the extended essay that will be submitted to the examiner.

To the best of my knowledge, the extended essay is the authentic work of the candidate.

*As per the section entitled "Responsibilities of the Supervisor" in the EE guide, the recommended number of hours spent with candidates is between 3 and 5 hours. Schools will be contacted when the number of hours is left blank, or where 0 hours are stated and there lacks an explanation. Schools will also be contacted in the event that number of hours spent is significantly excessive compared to the recommendation.*

I spent  hours with the candidate discussing the progress of the extended essay.

Supervisor's signature: \_\_\_\_\_

Date: 28/1/2015

**Assessment form (for examiner use only)**

Candidate session number		
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**Achievement level**

<b>Criteria</b>	Examiner 1	maximum	Examiner 2	maximum	Examiner 3
A research question		2	2	2	
B introduction		2	2	2	
C investigation		4	3	4	
D knowledge and understanding		4	3	4	
E reasoned argument		4	3	4	
F analysis and evaluation		4	3	4	
G use of subject language		4	3	4	
H conclusion		2	1	2	
I formal presentation		4	3	4	
J abstract		2	2	2	
K holistic judgment		4	3	4	
<b>Total out of 36</b>			28		

Name of examiner 1: \_\_\_\_\_ Examiner number: \_\_\_\_\_  
 (CAPITAL letters)

Name of examiner 2: \_\_\_\_\_ Examiner number: \_\_\_\_\_  
 (CAPITAL letters)

Name of examiner 3: \_\_\_\_\_ Examiner number: \_\_\_\_\_  
 (CAPITAL letters)

IB Assessment Centre use only: B: \_\_\_\_\_

IB Assessment Centre use only: A: \_\_\_\_\_

EXAM SESSION: May 2015

**EXTENDED ESSAY**

*/ R.M.*

**“Which type of feedback, intrinsic, extrinsic or both, has the greatest effect on learning how to serve a volleyball?”**

SUBJECT: Sports, Exercise and Health Science

WORD COUNT: 4000

# ABSTRACT

This investigation evaluates the effect certain types of feedback have on the learning of a skill: the types of feedback being classified under intrinsic and extrinsic types of feedback, and the skill being learnt is how to serve a volleyball. The research question is: **Which type of feedback, intrinsic or extrinsic or both, has the greatest effect on learning how to serve a volleyball?**

The experiment required participants in Year 10, aged 13 to 15, from two different physical education classes. A total of 40 participants participated in my experiment, 15 of which were male and 25 of which were female. Participants were separated into four types of feedback groups: Body Awareness (Intrinsic Feedback), Video recording (Extrinsic Feedback), Coach feedback (Extrinsic Feedback), and a combination of both Body Awareness and Coach feedback (Intrinsic and Extrinsic Feedback). By carrying out pre-tests and post-tests on the number of successful volleyball serves, I was able to obtain values for the mean difference and standard deviation of each type of feedback. My results were a mean difference of 0.4 serves for the extrinsic coach feedback, 0.3 serves for extrinsic video feedback, 0.2 for intrinsic and extrinsic feedback and 0.1 for intrinsic body awareness feedback. As my investigation looks at the effect from different types of feedback, I compared each feedback group to each other. I also compared and discussed these results to previous studies and research to examine to what extent my results were supported.

I concluded, I have found that there is a greater effect in people learning a skill with extrinsic coach feedback, than people learning a skill with intrinsic or a combination of intrinsic and extrinsic feedback.

Word Count: 278

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# INTRODUCTION

From the minute we are born, learning something new was of interest to us. Skill learning is an important aspect of life, whether it is learning a simple skill such as running or walking, or a more complex skill, such as dribbling in football. Skill learning allows individuals to learn, experience and understand more about the world. As skill learning is innate to everyone, huge interests have been shown into the research and study of what can be done to improve skill acquisition. Feedback is one of the major contributors to the improvement of skill learning and achievement, however the type of feedback and the way feedback is received is just as important. (Hattie and Timperley, 2007)

Feedback can be classified either as Intrinsic feedback or Extrinsic feedback (Carnell, 2002)

Intrinsic feedback refers to feedback given from internal sources, within the body. This usually originates from personal knowledge of performance. Interoceptors, namely sensory stores, internal visceral organs and muscular system, play a significant role in this type of feedback. Proprioceptors are another form of intrinsic feedback, as information from neuromuscular receptors, measuring tension or movement is given to an individual. (Carnell, 2002) Extrinsic feedback refers to feedback given from sources outside of the body. This feedback can either be from a coach, peer, or technological equipment, which gives athletes knowledge of results (Carnell, 2002).

The interest into the topic of skill learning and feedback originated from the question of whether skill learning could be improved individually, or whether external help would contribute to the improvement of skill learning. I further the interest in this topic as an athlete, as I am constantly pushing myself to get better at a certain skill, and the findings of this experiment can be extrapolated to myself and other athletes who are trying to improve in a skill.

Video recording, measuring extrinsic feedback, and a body awareness test, measuring intrinsic feedback, will be looked at in this investigation. It is important to note that video recording will represent visual feedback, while body awareness will represent the proprioceptor form of intrinsic feedback (Wrisberg, 2007). It is important to test the effect of feedback using video recording and a body awareness test because mentioned by Adams et al (1977) and Fleishman and Rich (1963) “there is no decrease in the importance of sensory information, but a shift in the importance of one source of sensory information to another, for example from visual to proprioceptive feedback”. This suggests that there is a difference in the roles of extrinsic and intrinsic feedback on skill learning, depending on our reliance of each type of feedback in the different stages of learning.

Coach feedback plays an important role in skill learning, as traditionally most responsibility for providing feedback is on the coach (Wrisberg, 2007). Coach feedback, measuring extrinsic feedback, is essential in learning a new skill as it allows athletes to be informed about errors that they might not have been able to pick up (Wrisberg, 2007). This is important in learning a new skill, as many novice athletes will have no idea of the errors they are making, and with coach feedback this will help them better understand and create a motor program of the correct skill execution. A combination of intrinsic and extrinsic feedback, portrayed through a body awareness test and coach feedback, is investigated, to see whether a combination of self-perceived and externally perceived errors have double the effect on skill learning. Errors referring to strength or angle used to serve the volleyball or the procedure of carrying out the serve.

The aim of this research is to find the effect of different types of feedback on the skill learning of a volleyball serve. My investigation will include 40 participants, aged between 13 to 15 year old students. Participants will be divided into four conditions: Intrinsic feedback: body awareness, Extrinsic feedback: video recording, Extrinsic feedback: coach feedback, Intrinsic & Extrinsic feedback: body awareness & coach feedback, each condition having ten participants. In all

*Wrisberg*



conditions, participants are asked to do a pre-test which involves serving a volleyball three times. Then participants are asked to do a post-test, which involves serving a volleyball ten times, while being given feedback. With the supporting evidence gathered above, I can hypothesize that participants in the combined intrinsic and extrinsic feedback group would have improved their skill of serving a volleyball more significantly than participants in the extrinsic and intrinsic feedback only groups. This may be due to the fact that participants will be given the opportunity to create proper motor program through coaching: extrinsic, while consolidating this motor program through self awareness: intrinsic feedback.

**Research Hypothesis (H<sub>1</sub>):** Participants allocated to extrinsic feedback groups and the combination group of intrinsic and extrinsic feedback, will significantly improve their serving skills compared to participants in the intrinsic feedback only group.

**Null Hypothesis (H<sub>0</sub>):** There will be no difference in skill improvements in the extrinsic feedback groups, intrinsic feedback group, and intrinsic & extrinsic feedback group.

# INVESTIGATION

## Design

As feedback is a qualitative type of data, it will be hard to numerically show the results. However if we test feedback in an experiment, we will be able to operationalize the results, while still being able to apply the results to skill learning in volleyball and other sports. By operationalizing results, it will be easier to compare the different types of feedback and eventually determine which type of feedback has the greatest effect on skill learning. One such study, that operationalizes feedback is that of Proteau et al (1987), which looks into visual feedback.

A body awareness test was chosen to measure intrinsic feedback, because it is relevant to the skill being learnt, and is also applicable to both novice and skilled athletes which is good, as the sample of participants in this experiment were randomly sampled. This means that some participants could be skilled at serving a volleyball, while others are relatively new to the skill.

## Participants:

This experiment was carried out on 40 (13 - 15 year old students) who had to do a pre-test and post-test, testing the improvement of serving a volleyball through various types of feedback. The independent variable was the types of feedbacks, which there was four: body awareness, video recording, coach feedback, body awareness & coach feedback. The results of this experiment can not be fully extrapolated to the population because of the limited types of feedback used, the type of skill being learnt and the age range of participants. However, these results give a better insight into the types of feedback that have a greater impact on skill learning, which can be applied to some sports and population groups.

## Protocol:

All ethical considerations have been met in this experiment. An email informing students of my experiment was sent prior to the experiment, and participants had the right to withdraw from the

experiment. This email could have been shown to parents, to gain parental consent, however parental consent wasn't required as participants would be harmed in no way. A Par-Q (*Appendix A*) will make sure that participants are fit enough to participate in my experiment. A briefing to participants at the beginning of the experiment will inform participants of my aim and method for the experiment. Participants names were taken down during the experiment, to ensure that the data collected was in fact performed by the right participant, however, after all the data was collected, the participants were referred to by numbers (1, 2, 3, etc.).

**Statistical Analysis:**

Firstly, successful volleyball serves will be marked as one point, whereas an unsuccessful volleyball serve will be marked as no points or zero. A successful volleyball serve is considered to be a serve that is over the net and in the court, whereas an unsuccessful volleyball serve is a serve that doesn't go over the net, or goes over the net and lands elsewhere but the court. This has been done to operationalize results, turning qualitative results into quantitative results. This will be easier to portray the difference between the types of feedback.

Secondly, the mean was chosen as the measure of central tendency as it best suits the type of experiment being conducted. The mean takes into account all the values, which is good because there could be a large difference in values recorded. Also the mean works alongside with standard deviation, as standard deviation measures all the values and their closeness in relation to the mean.

# APPARATUS

<b>Name of Apparatus / Equipment</b>	<b>Quantity Needed</b>	<b>Relevance to Experiment</b>
Volleyballs	15	Volleyballs will be used when learning the skill of serving.
Video Camera	1	A video camera will be used as one type of Extrinsic Feedback. This will record the participants carrying out the volleyball serves.
Modified Volleyball Court - Badminton net	5	Since the majority of participants will be novice athletes, I have modified the original sized volleyball court and net height. This will be more representative of the developmental learning of the skill, as results will be acquired.
Modified Volleyball Court - Badminton poles	10	Since the majority of participants will be novice athletes, I have modified the original sized volleyball court and net height. This will be more representative of the developmental learning of the skill, as results will be acquired.

# METHOD

*Amma*

Preliminary:

Create a spreadsheet that requires participants to record:

- Age
- Gender

This information will be recorded in two columns, however, the participants will be separated into four different sections: representing the four different types of feedback being examined in this investigation.

<b>Intrinsic Feedback: Body Awareness</b>			
Participant Number	Age	Gender	

Within the same spreadsheet create another eight columns. Three of these columns will be listed under the 'Pre-test Volleyball Serve' while the other five columns, listed under 'Post-test Volleyball Serve'. There are five different trials in the post-test section as every two serves will be followed up with the type of feedback, accumulating up to ten serves.

<b>Pre-test Volleyball Serve</b>			<b>Post-test Volleyball Serve</b>				
Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5

## **PROCEDURE**

1. Gather two Year 10 physical education classes, participants aged between 14 and 15 years of age.
2. Demonstrate to the participants, as a whole, how to serve a volleyball. The demonstration will be shown 3 times and the serving process will be told to participants, however, no additional information should be given.
3. Split the classes into 4 different groups, each group representing a type of feedback to be examined during the experiment.
  - Group 1: Intrinsic Feedback (Body Awareness)
  - Group 2: Extrinsic Feedback (Video Recording)
  - Group 3: Extrinsic Feedback (Coach Feedback)
  - Group 4: Intrinsic & Extrinsic Feedback (Body Awareness combines with Coach Feedback)

### **Group 1: Intrinsic Feedback Testing (Body Awareness)**

- (i) Perform a 'pre-test' volleyball serve. This requires students to attempt at serving a volleyball over the net, 3 times. These three tests will be averaged later on.
- (ii) After this before test, the participants will be shown how to serve a volleyball again, however only once more.
- (iii) With the intrinsic feedback group, participants will serve the ball twice.
- (iv) They will then be required to write a reflection portraying body awareness. This reflection will include guiding questions. Guiding questions will be provided based on the assumption that novice athletes are not familiar with what should feel right or wrong after a volleyball serve. *(See Appendix B)*
- (v) Participants will then go back to serving the ball twice more, using their previous feedback.
- (vi) Steps (iii) - (v) will be repeated until a total of 10 serves are made.
- (vii) The results of all five trials will be averaged later on.

### **Group 2: Extrinsic Feedback Testing (Video Recording)**

- (i) Perform a 'pre-test' volleyball serve. (3 attempts)
- (ii) After this pre-test, the participants will be shown how to serve a volleyball again, however only once more.
- (iii) Once steps (i) - (ii) have been completed, participants will serve the ball twice. (Start of the post-test serves)
- (iv) Individually, participants will then look at their own performance on the video camera.
- (v) Participants will then go back to serving the ball twice more, using the previous feedback.
- (vi) Steps (iii) - (v) will be repeated until a total of 10 serves are made.
- (vii) The results of all five trials will be averaged later on.

### **Group 3: Extrinsic Feedback Testing (Coach Feedback)**

- (i) Perform a 'pre-test' volleyball serve. (3 attempts)
- (ii) After this before test, the participants will be shown how to serve a volleyball again, however only once more.
- (iii) Once steps (i) - (ii) have been completed, participants will serve the ball twice. (Start of the post-test serves)
- (iv) Individually, participants will receive feedback from the coach.
- (v) Participants will then go back to serving the ball twice more, using the previous feedback.
- (vi) Steps (iii) - (v) will be repeated until a total of 10 serves are made.
- (vii) The results of all five trials will be averaged later on.

**Group 4: Intrinsic and Extrinsic Feedback (Body Awareness and Coach Feedback)**

- (i) Perform a 'pre-test' volleyball serve. (3 attempts)
- (ii) After this before test, the participants will be shown how to serve a volleyball again, however only once more.
- (iii) Once steps (i) - (ii) have been completed, participants will serve the ball twice.
- (iv) Firstly, participants will be required to verbally reflect, using the guiding questions, about their performance in the form of body awareness. (*Appendix B*)
- (v) After finishing this body awareness reflection, participants will receive feedback from the coach.
- (vi) Participants will then go back to serving the ball twice more, using the pervious feedback.
- (vii) Steps (iii) - (vi) will be repeated until a total of 10 serves are made.
- (viii) The results of all five trials will be averaged later on.

— Did the test help with how the give a feedback?

— Are they self motivated anyway? Question to Fern.

# RESULTS

\* Processed data taken from raw data tables 1.1, 1.2, 1.3 and 1.4 can be found in Appendix\*

Table 2.1: Processed data from table 1.1 (Appendix B) Mean and Standard Deviation of Intrinsic Feedback: Body Awareness.

<b>Participant Number</b>	<b>Mean Pre-test Volleyball Serve</b>	<b>Mean Post-test Volleyball Serve</b>	<b>Difference in Volleyball Serves</b>
1	1.0	1.0	0.0
2	0.3	0.8	0.5
3	0.0	0.3	0.3
4	0.6	0.6	0.0
5	0.6	0.8	0.2
6	1.0	0.7	-0.3
7	1.0	0.7	-0.3
8	0.0	0.2	0.2
9	0.0	0.5	0.5
10	0.3	0.3	0.0
		<b>Mean</b>	<b>0.1</b>
		<b>Standard Deviation</b>	<b>0.28</b>



Table 2.2: Processed data from table 1.2 (Appendix C) Mean and Standard Deviation of Extrinsic Feedback: Video Recording.

<b>Participant Number</b>	<b>Mean Pre-test Volleyball Serve</b>	<b>Mean Post-test Volleyball Serve</b>	<b>Difference in Volleyball Serves</b>
1	0.0	0.5	0.5
2	0.0	0.2	0.2
3	0.0	0.3	0.3
4	0.3	0.6	0.3
5	0.3	0.5	0.2
6	0.3	0.8	0.5
7	0.0	0.0	0.0
8	0.3	0.5	0.2
9	0.0	0.5	0.5
10	0.6	0.9	0.3
		<b>Mean</b>	<b>0.3</b>
		<b>Standard Deviation</b>	<b>0.36</b>

Table 2.3: Processed data from table 1.3 (Appendix D) Mean and Standard Deviation of Extrinsic Feedback: Coach Feedback.

<b>Participant Number</b>	<b>Mean Pre-test Volleyball Serve</b>	<b>Mean Post-test Volleyball Serve</b>	<b>Difference in Volleyball Serves</b>
1	0.6	0.9	0.3
2	0.3	0.8	0.5
3	0.0	0.3	0.3
4	0.3	0.8	0.5
5	0.3	0.6	0.3
6	1.0	1.0	0.0
7	0.3	1.0	0.7
8	0.0	0.7	0.7
9	0.6	0.8	0.2
10	0.0	0.3	0.3
		<b>Mean</b>	<b>0.4</b>
		<b>Standard Deviation</b>	<b>0.22</b>

Table 2.4: Processed data from table 1.4 (Appendix E) Mean and Standard Deviation of combination of Intrinsic and Extrinsic Feedback: Body Awareness& Coach Feedback.

<b>Participant Number</b>	<b>Mean Pre-test Volleyball Serve</b>	<b>Mean Post-test Volleyball Serve</b>	<b>Difference in Volleyball Serves</b>
1	0.3	0.8	0.5
2	0.6	0.8	0.2
3	0.6	0.6	0.0
4	0.6	0.7	0.1
5	0.6	0.6	0.0
6	1.0	1.0	0.0
7	0.0	0.2	0.2
8	0.6	0.6	0.0
9	0.3	0.8	0.5
10	0.6	0.8	0.2
		<b>Mean</b>	<b>0.2</b>
		<b>Standard Deviation</b>	<b>0.19</b>

## Sample Calculations:

### Mean Pre-test Volleyball Serve

The mean of the pre-test volleyball serves was calculated by adding up all three trials, then dividing that number by three, as there was only one serve per trial.

E.g.

$$1 + 0 + 0 = 3$$

$$3/3 = 1$$

The mean of this one participant is 1.

### Mean Post-test Volleyball Serve

The mean of the post-test volleyball serves was calculated by adding all five trials, then dividing that number by ten, as there was two serves per trial.

E.g.

$$1 + 1 + 2 + 2 + 2 = 8$$

$$8/10 = 0.8$$

The mean of this one participant is 0.8.

### Mean difference in Post-test/ Pre-test Volleyball Serve

The difference between post-test and pre-test volleyball serves was calculated by subtracting the pre-test means from the post-test means.

E.g.

$$\text{post-test} - \text{pre-test} = \text{mean difference}$$

$$0.8 - 0.3 = 0.5$$

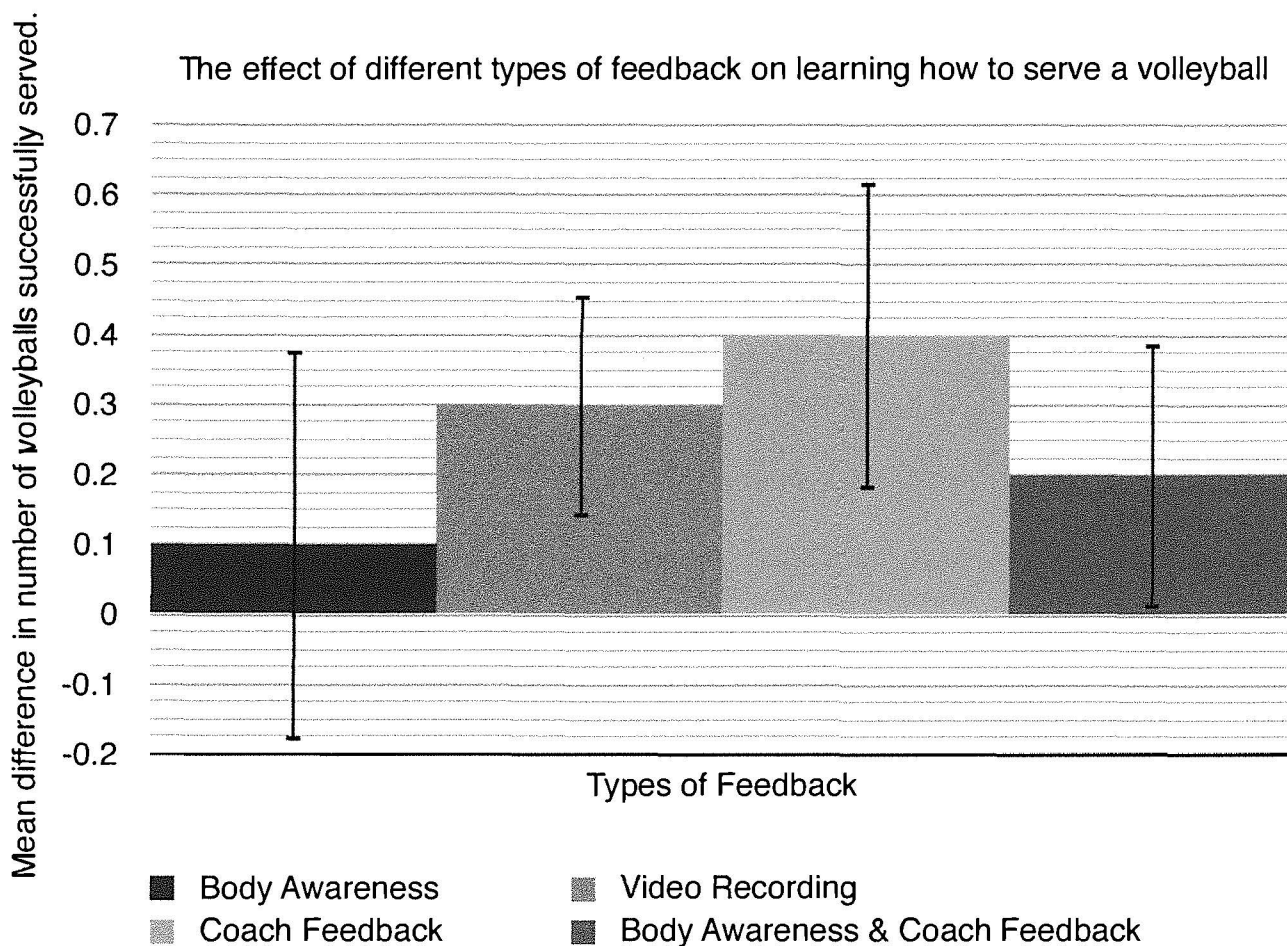
The mean difference of this participant is 0.5.

### Standard Deviation of Mean Difference

Standard deviation for this experiment was calculated using a TI-nspire calculator. (*Appendix F*)  
However standard deviation can be calculated using this formula:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2}$$

Graph 3.1: The mean effect of different types of feedback on learning how to serve a volleyball.



The error bars on the graph represent standard deviation, which measures the spread of data in relation to the mean.

# REASONED ARGUMENT

This experiment tested the effect of intrinsic and extrinsic types of feedback on the skill learning of individuals. I will be discussing and comparing the results of each type of feedback: body awareness, video recording, coach feedback, body awareness & coach feedback, while including past studies and research to support the evidence collected from the experiment.

My research hypothesis, “ Participants in the combined intrinsic and extrinsic feedback group would have improved their skill of serving a volleyball more significantly than participants in the extrinsic feedback only and intrinsic feedback only groups” is not supported by the results from the experiment. From my results, the extrinsic group of coach feedback had the largest improvement in the number of volleyballs served (0.4) compared to the extrinsic group of video recording (0.3), intrinsic group of body awareness (0.1), intrinsic and extrinsic group of body awareness and coach feedback (0.2). These results are supported by Pedretti, Pendleton and Krohn, (2006) as they state that extrinsic feedback is helpful in the early stages of learning process when compared to intrinsic feedback, as novice players will not understand the errors they are creating because they haven't yet understood the correct or appropriate methods in carrying out the skill.

The results of extrinsic video recording feedback are supported by Robertson et al's 1994 study, which looked at dependency on visual feedback in expert and novice gymnasts. Participants in this experiment were asked to walk across a balance beam wearing occlusion goggles, affecting their visual feedback. Robertson found that expert gymnasts were able to walk the balance beam in the same time that they would have taken without the occlusion goggles, whilst novice gymnasts took significantly longer with the occlusion goggles on. This suggests that expert gymnasts are less dependent on visual feedback than novices (Robertson et al, 1994). Robertson et al's study can help explain the performance seen in the video recording group, as most of the participants were novice

My experiment had a few flaws, which could be avoided if this experiment were to be recreated. Firstly, the method of sampling used was opportunity sampling, which means that a specific population group was recruited, meaning that results could only be applied to that specific target population. This flaw could have been improved if participants were chosen randomly. By doing this, the age range of participants would be larger, and results could be generalized to a larger population. Another flaw was the sample size. While 40 participants, 15 male and 25 female, in total seems ideal, it really is only 10 participants per condition, making the sample size per condition very small. To improve this flaw, a larger sample size should be used per condition, and this can be done by making the target population wider, allowing more types of people to participate in this experiment. Another flaw was the time span in which skill learning and feedback was given to participants. It is hard to state that the results in this experiment are concrete, as participants were taught the new skill, given feedback on their performance, and the results of the feedback on their performance were all collected in one day, more specifically in 1 hour and 40 minutes.

volleyball players, they heavily relied on the video recording to visualize and better understand the errors they were making. Adams et al (1977) and Fleishman and Rich (1963) further support these results as they state that “there is no decrease in the importance of sensory information, but a shift in the importance of one source of sensory information to another, for example, from visual to proprioceptive feedback.” This explains why participants improved more in the video recording feedback group than the body awareness group, because participants are relatively novice, so their dependency on visual feedback is greater. However, as these participants gain more practice of serving a volleyball, their dependency on visual feedback will shift to proprioceptive feedback, which in this case, a body awareness test would be more suitable.

Another finding is that the standard deviation of the coach feedback group and the body awareness feedback group were relatively similar, coach feedback being 0.22 and body awareness being 0.28, however the mean difference of the two types of feedback were completely different, coach feedback being 0.4 while body awareness was 0.1. I concluded that the reason the standard deviations were similar is because of the nature of the type of feedback. Both body awareness and coach feedback are specific to the individual's performance. Body awareness tests the individual's proprioceptive feedback, whereas coach feedback tests the individual's performance on the criteria of the skill, and inform the individual of how to improve according to their individual abilities. This type of feedback is specific to the individual, which will cause variations as not everyone has the same ability and skill. Whereas the video recording feedback, where standard deviation was 0.16. This is because video recording is the visual representation of an individual's performance, and the way participants perceive their performance will most likely be the same. This is because they are all of novice experience, and they only know the general feedback, not specific to themselves, on their performance, which would be the form of their position while serving, or tossing the volleyball before serving, etc.



# CONCLUSION

As skill learning is an essential process of any individuals' journey in becoming an athlete, I decided to focus on what types of feedback help improve skill learning, and to what extent these types of feedback have on skill learning. I believe that this topic is important as individuals can efficiently spend time on the appropriate skill learning and training techniques, specified to a particular sport.

From the results of my experiment, I have found that the extrinsic feedback group with coach feedback, had the greatest impact on skill learning (learning how to serve a volleyball), with a mean difference of 0.4. Participant's skills in the video recording group improved by a mean difference of 0.3, and body awareness & coach feedback improved by 0.2, while body awareness improved by 0.1. However, with that being said, it is evident that feedback has an effect on skill learning, no matter how small the impact or the span of time in which feedback was given to participants.

Based on the findings of the results, athletes should seek extrinsic feedback when learning a new skill as this helps athletes gain a better understanding of the errors they are creating, whether they are doing the wrong form or missing technical aspects of the skill. However, as an athlete becomes more skilled, they should aim to look for intrinsic feedback on performance. This allows the athlete to better understand their personal abilities towards the skill and create specific goals from there, to better themselves as athletes. However, not all the findings in this experiment can be extrapolated to the general population, as the effect of feedback was looked on sport and not on academics. Also, a small sample size was used, students aged 13 to 15 studying at an International School in Hong Kong. In order for the findings of this experiment to be consolidated and generalized to the population, further experiments into the effects of feedback in different fields, with a larger target population, should be carried out.

# References

- Carnell, D. (2002). Chapter 7: Information Processing. *Advanced PE for OCR AS* (p. 141). Oxford: Heinemann.
- Fulton, R. E. (1950). Relationship between Teammate Status and Measures of Skill in Volleyball. *Research Quarterly. American Association for Health, Physical Education and Recreation*, 21(3), 274-276.
- Hattie, J., & Timperley, H. (2007). The Power Of Feedback. *Review of Educational Research*, 77(1), 81-112.
- Magill, R. A. (1994). The Influence of Augmented Feedback on Skill Learning Depends on Characteristics of the Skill and the Learner. *Quest* , 46(3), 314-327.
- Margolis, J. F., & Christina, R. W. (1981). A Test of Schmidt's Schema Theory of Discrete Motor Skill Learning. *Research Quarterly for Exercise and Sport*, 52(4), 474-483.
- Pedretti, L. W., Pendleton, H. M., & Krohn, W. (2006). *Pedretti's occupational therapy: practice skills for physical dysfunction* (6th ed.). St. Louis, Mo.: Mosby/Elsevier.
- Schmidt, R. A. (1975). A Schema Theory Of Discrete Motor Skill Learning.. *Psychological Review*, 82(4), 225-260.
- Sun, R., Slusarz, P., & Terry, C. (2005). The Interaction of the Explicit and the Implicit in Skill Learning: A Dual-Process Approach.. *Psychological Review*, 112(1), 159-192.
- Williams, A. M., & Hodges, N. J. (2004). *Skill acquisition in sport: research, theory and practice*. London: Routledge.
- Wrisberg, C. A. (2007). Chapter 8: Providing Feedback. *Sport skill instruction for coaches* (pp. 113-118). Champaign, IL: Human Kinetics.
- Wulf, G., Mcconnel, N., Gartner, M., & Schwarz, A. (202). Enhancing the learning of Sport Skills Through External-Focus Feedback. *Journal of Motor Behavior* , 34(2), 171-182.

# APPENDIX

## APPENDIX A

### Par-Q Form

<b>Question</b>	<b>Yes</b>	<b>No</b>
Do you take any medication on a regular basis?		
Have you been hospitalized recently?		
Have you had any upper body issues recently?		
Do you do regular exercise?		
Do you have any current major injuries? If yes, state in the respective column.		
Do you know of any other reason that would prevent you from participating in physical activities?		

If you answered NO to all of the questions above, you are cleared for this experiment.

You should:

- Sign the bottom of this sheet, and hand it in to a person in charge.

If you answered YES to one or more of the questions above:

You should:

- Not participate in this experiment
- Consult your physician before engaging in any other physical activities.

Name:

Parent/Guardian Name:

Parent/Guardian Signature:

Date:

## **APPENDIX B**

### **Guiding Questions for Body Awareness feedback group**

Guiding Questions:

- Did the ball go over the net?
- Did your hand come in contact with the ball? If so, state where on the ball. Top, Bottom, Middle?
- Did your swinging arm, end in a higher position or lower position? Facing the ceiling, or floor?
- Was there a swinging motion in your body? Somewhat similar to that of a baseball swing.

## **APPENDIX C**

**Table 1.1: Raw Data from Intrinsic Feedback: Body Awareness group**

Participant Number	Pre-test Volleyball Serve			Post-test Volleyball Serve				
	Trial 1 (Number of successful serves over the net, out of 1 serve)	Trial 2 (Number of successful serves over the net, out of 1 serve)	Trial 3 (Number of successful serves over the net, out of 1 serve)	Trial 1 (Number of successful serves over the net, out of 2 serves)	Trial 2 (Number of successful serves over the net, out of 2 serves)	Trial 3 (Number of successful serves over the net, out of 2 serves)	Trial 4 (Number of successful serves over the net, out of 2 serves)	Trial 5 (Number of successful serves over the net, out of 2 serves)
1	1	1	1	2	2	2	2	2
2	1	0	0	2	2	2	1	1
3	0	0	0	1	0	1	0	1
4	0	1	1	1	1	1	1	2
5	0	1	1	1	2	2	2	1
6	1	1	1	2	2	1	1	1
7	1	1	1	1	1	2	2	1
8	0	0	0	0	1	1	0	0
9	0	0	0	1	2	0	1	1
10	0	0	1	0	0	0	2	1

**APPENDIX D****Table 1.2: Raw Data from Extrinsic Feedback: Video Recording group**

Participant Number	Pre-test Volleyball Serve			Post-test Volleyball Serve				
	Trial 1 (Number of successful serves over the net, out of 1 serve)	Trial 2 (Number of successful serves over the net, out of 1 serve)	Trial 3 (Number of successful serves over the net, out of 1 serve)	Trial 1 (Number of successful serves over the net, out of 2 serves)	Trial 2 (Number of successful serves over the net, out of 2 serves)	Trial 3 (Number of successful serves over the net, out of 2 serves)	Trial 4 (Number of successful serves over the net, out of 2 serves)	Trial 5 (Number of successful serves over the net, out of 2 serves)
1	0	0	0	1	1	0	1	2
2	0	0	0	1	0	0	0	1
3	0	0	0	0	0	1	1	1
4	0	0	1	1	2	2	1	0
5	0	1	0	1	1	1	1	1
6	0	1	0	1	1	2	2	2
7	0	0	0	0	0	0	0	0
8	0	0	1	1	2	1	0	1
9	0	0	0	1	1	1	1	1
10	1	0	1	2	2	2	2	1

**APPENDIX E**

Table 1.3: Raw Data from Extrinsic Feedback: Coach Feedback group

Participant Number	Pre-test Volleyball Serve			Post-test Volleyball Serve				
	Trial 1 (Number of successful serves over the net, out of 1 serve)	Trial 2 (Number of successful serves over the net, out of 1 serve)	Trial 3 (Number of successful serves over the net, out of 1 serve)	Trial 1 (Number of successful serves over the net, out of 2 serves)	Trial 2 (Number of successful serves over the net, out of 2 serves)	Trial 3 (Number of successful serves over the net, out of 2 serves)	Trial 4 (Number of successful serves over the net, out of 2 serves)	Trial 5 (Number of successful serves over the net, out of 2 serves)
1	1	0	1	2	1	2	2	2
2	0	1	0	2	2	0	2	2
3	0	0	0	0	0	1	1	1
4	0	1	0	2	2	1	1	2
5	0	1	0	2	1	1	1	1
6	1	1	1	2	2	2	2	2
7	0	0	1	2	2	2	2	2
8	0	0	0	1	1	2	1	2
9	1	1	0	2	2	1	1	2
10	0	0	0	0	1	1	0	1

**APPENDIX F****Table 1.4: Raw Data from Intrinsic and Extrinsic Feedback: Body Awareness & Coach Feedback group**

Participant Number	Pre-test Volleyball Serve			Post-test Volleyball Serve				
	Trial 1 (Number of successful serves over the net, out of 1 serve)	Trial 2 (Number of successful serves over the net, out of 1 serve)	Trial 3 (Number of successful serves over the net, out of 1 serve)	Trial 1 (Number of successful serves over the net, out of 2 serves)	Trial 2 (Number of successful serves over the net, out of 2 serves)	Trial 3 (Number of successful serves over the net, out of 2 serves)	Trial 4 (Number of successful serves over the net, out of 2 serves)	Trial 5 (Number of successful serves over the net, out of 2 serves)
1	1	0	0	1	1	2	2	2
2	0	1	1	1	2	2	1	2
3	1	0	1	0	1	2	1	2
4	0	1	1	1	1	1	2	2
5	0	1	1	1	1	1	1	2
6	1	1	1	2	2	2	2	2
7	0	0	0	0	0	1	1	0
8	0	1	1	1	2	1	1	1
9	0	1	0	2	1	1	2	2
10	1	0	1	1	2	2	2	1

**APPENDIX F**

Standard deviation using TI-nspire calculator

