

# AN EVALUATION OF STRENGTH AND CONDITIONING TRAINING PROGRAMS IN IPU MEN'S HANDBALL TEAM

## IPU 男子ハンドボール部におけるストレングス&コンディショニング プログラムの評価

体育学部体育学科

楠本 欣司

木野 実

KUSUMOTO, Kinji

KINO, Minoru

Department of Physical Education

Faculty of Physical Education

**Keywords :** Handball, Strength and Conditioning Training Program, Questionnaire

**要 旨 :** 本研究は、IPU 男子ハンドボール部が 6 ヶ月間実施してきたストレングス&コンディショニング (S & C) トレーニングプログラムに関する意識調査を目的として行った。部員 14 名を対象としてアンケート調査を行い、結果はトレーニングによる身体能力の向上 (81.8%) ・プログラムの内容に関する満足度 (92.9%) ・専門インストラクターに対する現場指導力 (100%) などの項目に対してポジティブな回答を得た。またトレーニングを通じて関連する解剖生理学・トレーニング理論・栄養学などにも興味を持っていることを把握することができた (75.1%)。しかし大半のものは来年度の後輩に対するトレーニング指導に関してある程度の自信しかない (71.4%) と回答したために、単純にトレーニングを行うだけでなく将来指導者としての活躍ができるための教育の必要性も感じた。

**キーワード :** ハンドボール、ストレングス&コンディショニングトレーニングプログラム、アンケート調査

### I. INTRODUCTION

International Pacific University (IPU) has established in April 2007, and IPU men's handball team also has organized at the same time. Members on the team are obviously all freshmen. Amazingly, the team participated in a districted college handball championship game just after one month when the players met each other for the first time. Fortunately, the team won the third place ; however, the IPU men's handball head coach was never satisfied with the result even for their first games. He strongly considered that his players were supposed to develop their competitive performance for next games. Thus, he visited at an IPU medical center and requested a team doctor to build up their physical abilities better.

An IPU strength and conditioning (S & C) instructor immediately designed an exercise program, and the coach agreed with the exercise description without any questions. The instructor has been training the athletes hard since the first games were done.

A total of three S & C training programs were design until now. Each training program shows in table 1 , table 2 , and table 3 . Basically, all of the training programs were planned to be performed within approximately two hours including warming-up and cooling-down. The training programs always included with two major purposes following by National Strength and Conditioning Association Guideline ; preventing athletic injuries and improving athletic performance (Beachle and Earle. 2000).

At the beginning of the first training section, the instructor explained aims of each exercise,

benefits of the training, and methods of correct movement patterns very carefully and specifically. Although the athletes struggled to understand the trainings in the early days, they gradually learned how they exercise with strong confidence, motivation, and ambition.

It has passed almost six months since they started the trainings. Therefore, the purpose of this study was to evaluate the strength and conditioning training programs in the IPU men's handball team. It might obtain helpful responses how the S&C training programs affected to the athletes and might also provide practical information to identify their current training status through the results.

## II. PROCEDURES

### SUBJECTS

There are fifteen players in the IPU men's handball team. A total of 14 athletes (average age :  $18.7 \pm 0.7$  years ; height :  $172.0 \pm 0.04$ cm ; mass :  $67.9 \pm 7.4$ kg ; BMI :  $23.0 \pm 2.4$ ) participated and completed this research. One subject missed this study due to a personal reason. The subjects fully apprised of the nature of the research project and volunteer to participate by signed on informed consent form. This study was approved by the department of physical education for research reviews involving human subjects at IPU.

### METHODS

It was one day survey conducted on the 1st campus of IPU during the 2007 semester.

Before filling in a questionnaire, the subjects received a verbal explanation for this study, including a description of its purpose, risks, and benefits. The subjects then received an informed consent form and signed the form if they agreed to participate.

The questionnaire consisted of 10 multiple-choice questions, and the contents show in table4.

Table 4. Contents of the Questionnaire

|  |
|--|
| Q1 : Have you ever been trained by any S&C instructors before entering IPU ?         |
| Q2 : What are your own purposes of the S&C Training? *                               |
| Q3 : Do you feel anything has changed since you started the S&C training? *          |
| Q4 : How long do you think the appropriate training time to spend per a section?     |
| Q5 : What lectures do you want to take if the S&C instructor offers? *               |
| Q6 : Do you have any dissatisfaction about the things related to the S&C training? * |
| Q7 : What do you think about the training programs designed by the S&C instructor?   |
| Q8 : What do you think about the S&C instructor's practical guidance?                |
| Q9 : What do you request for the current S&C training programs? *                    |
| Q10 : Do you think you will be able to train freshmen correctly in the next year?    |

\* Two or more answers possible

Those questions assessed the followings : (1) training guidance experience, (2) individuals' training purposes, (3) current conditions, (4) appropriate training time, (5) optional lectures, (6) environmental problems, (7) the exercise contents evaluation, (8) the S & C instructor evaluation, (9) requests for the trainings, and (10) leadership . Some questions allowed choosing two or more answers if they wanted to. There was no time limit to answer, and the subjects' confidentialities were insured by an investigator.

As soon as the subjects filled in the questionnaire, the investigator collected the forms and then averaged the data. In this study, a statistical analysis was not performed.

## III. RESULTS

For the question number one, 21.4% of the subjects had been trained by S&C instructors before they entered IPU. The range of their guidance periods were from one day to six months during their high school ages. Conversely, 78.6% of the subjects had no S&C training guidance experiences. (Table 5)

Table 5. Training Guidance Experience

| Q1 : Have you ever been trained by any S&C instructors before entering IPU ? |                |
|--|----------------|
| Yes  | 21.4% (n = 3)  |
| No   | 78.6% (n = 11) |

For the question number two, 36.1% of the subjects trained toward improving their physical abilities as their own purpose ; 30.6% of the subjects trained toward preventing athletic injuries ; and 16.7% of the subjects trained toward learning coaching skills for the future and making 'teamwork' better. (Table 6)

Table 6. Individuals' Training Purposes

| Q2 : What are your own purposes of the S&C training? * |                |
|--|----------------|
| Improving physical abilities                           | 36.1% (n = 13) |
| Preventing athletic injuries                           | 30.6% (n = 11) |
| Learning coaching skills for the future                | 16.7% (n = 6)  |
| Making 'teamwork' better                               | 16.7% (n = 6)  |
| Other  | 0.0% (n = 0)   |

\* Two or more answers possible

For the question number three, 33.3% of the subjects felt their body sizes has developed since the training started ; 30.3% of the subjects felt their muscular strength has increased ; 18.2% of the subjects felt less fatigue during they exercise ; 15.2% of the subjects felt mental toughness has developed ; and 3.0% of the subjects answered feeling 'the center of the body'during exercise. (Table 7)

Table 7. Current Conditions

| Q3 : Do you feel anything has changed since you started the S&C training? * |                |
|---|----------------|
| Developing body size (Hypertrophy)  | 30.3% (n = 10) |
| Increasing muscular strength  | 33.3% (n = 11) |
| Less fatigue during exercise  | 18.2% (n = 6)  |
| Developing mental toughness   | 15.2% (n = 5)  |
| Other   | 3.0% (n = 1)   |

\* Two or more answers possible

For the question number four, 71.2% of the subjects thought two hours long is the appropriate training time to spend per a section ; 14.3% of the subjects thought one hour long ; and 7.1% of the subjects thought either 2 hours and 30 minutes or only 30 minutes long. (Table 8)

Table 8. Appropriate Training Time

| Q4 : How long do you think the appropriate training time to spend per a section ? |                |
|---|----------------|
| Over 3 hours  | 0.0% (n = 0)   |
| 2 hours   | 72.1% (n = 10) |
| 1 hours   | 14.3% (n = 2)  |
| 30 minutes  | 7.1% (n = 1)   |
| Other   | 7.1% (n = 1)   |

For the question number five, 30.6% of the subjects wanted to take 'Training Methods and Theories' as an optional lecture if the S & C instructor would offer ; 27.8% of the subjects want to take 'Sports Nutrition' ; 22.2% of the subjects want to take 'Mental Training' ; 16.7% of the subjects want to take 'Human Anatomy & Exercise Physiology' ; but 2.8% of the subjects answered 'nothing'. (Table 9)

Table 9. Optional Lectures

| Q5 : What lectures do you want to take if the S&C instructor offers? * |                |
|--|----------------|
| Human Anatomy & Exercise Physiology                                    | 16.7% (n = 6)  |
| Sports Nutrition   | 27.8% (n = 10) |
| Training Methods and theories  | 30.6% (n = 11) |
| Mental Training  | 22.2% (n = 8)  |
| Other  | 2.8% (n = 1)   |

\* Two or more answers possible

For the question number six, 54.5% of the subjects dissatisfied with the small facility of the training center ; 31.8% of the subjects dissatisfied with less training equipments to use ; 9.1% of the subjects dissatisfied with the training time to spend, the training frequency, and the location of the training center ; but only 4.5% of the subjects satisfied with the current environment. (Table 10)

Table 10. Environmental Problems

| Q6 : Do you have any dissatisfaction about the things related to the S&C training? * |                |
|--|----------------|
| Nothing  | 4.5% (n = 1)   |
| Small facility   | 54.5% (n = 12) |
| Less training equipments   | 31.8% (n = 7)  |
| The S & C instructor   | 0.0% (n = 0)   |
| Other  | 9.1% (n = 2)   |

\* Two or more answers possible

For the question number seven, 92.9% of the subjects satisfied with the S & C training contents ; however, 7.1% of the subjects were afraid of the qualities of the training from the next year. (Table 11)

Table 11. The Exercise Contents Evaluation

| Q7 : What do you think about the training programs designed by the S&C instructor? |              |
|--|--------------|
| Very good  | 78.6% (n=11) |
| Good   | 14.3% (n=2)  |
| Bad  | 0.0% (n=0)   |
| Very bad   | 0.0% (n=0)   |
| Other  | 7.1% (n=1)   |

For the question number eight, the all subjects completely satisfied with the S & C instructor's practical guidance. (Table 12)

Table 12. The S&C Instructor Evaluation

| Q8 : What do you think about the S&C instructor's practical guidance? |              |
|---|--------------|
| Very good   | 92.9% (n=13) |
| Good  | 7.1% (n=1)   |
| Bad   | 0.0% (n=0)   |
| Very bad  | 0.0% (n=0)   |
| Other   | 0.0% (n=0)   |

For the question number nine, 37.5% of the subjects requested to have a personal S & C training program ; 18.8% of the subjects requested to have a program 'for specific playing positions' and 'for weak body parts', yet ; 31.3% of the subjects had no requests. (Table 13)

Table 13. Requests for the Trainings

| Q9 : What do you request for the current S&C training programs ? * |             |
|--|-------------|
| Nothing  | 31.3% (n=5) |
| Designing personal S&C training program                            | 37.5% (n=6) |
| Introducing the latest and newest exercise program                 | 12.5% (n=2) |
| I want to train by myself  | 0.0% (n=0)  |
| Other  | 18.8% (n=3) |

\* Two or more answers possible

For the question number ten, 71.4% of the subjects thought that they would be able to train freshmen correctly in some parts in the next year ; 21.4% of the subjects answered they would train new players completely ; but 7.1% of the subjects thought that they had less confidence to

teach freshmen trainings. (Table 14)

Table 14. Leadership

| Q10 : Do you think you will be able to train freshmen correctly in the next year? |              |
|---|--------------|
| Yes, definitely   | 21.4% (n=3)  |
| Yes, some parts   | 71.4% (n=10) |
| No, some parts  | 0.0% (n=0)   |
| No, definitely  | 7.1% (n=1)   |
| Other   | 0.0% (n=0)   |

## IV. DISCUSSION

Handball is a sport combining aspects of basketball, soccer, and baseball. This sport requires physical strength and mental toughness similar to the other sports (Cardoso Marques. 2006). It also includes many athletic abilities such as speed, power, agility, balance, flexibility, neuromuscular coordination, and cardiovascular endurance (Rogulj. 2005). There are many athletic injuries happened because handball is a contact sport unlike basketball and volleyball (Olsen. 2006, Langevoort. 2007). Thus, there is no doubt that the IPU men's handball players had to train in order to prevent injuries and to improve athletic abilities.

This study was a fundamental research that evaluated how the S & C training affected to the team. There was some useful information found through the results.

First of all, they enthusiastically work out with no complaints today even though the most of the athletes had never trained by any specific S & C instructors before entering IPU. Roughly 80% of the subjects have felt their physical changes such as developing body sizes, increasing muscular strength, and feeling less fatigues during exercise. Those are the nature of the exercise (Gorostiaga et al. 2006, Izquierdo et al. 2002), yet their enhanced athletic abilities actually caused their athletics' performance positive in next games. Improving athletic performance was one of the purposes of a S & C training, and the players found out the meaning of it all the way through such physical training activities.

Secondly, they have interests in learning about things related to the S&C training. Through the questions number 5 and 9, they answered that they wanted to study 'training methods and theories' and requested to have their own training programs. They just used to exercise in the beginning ; however , they avariciously listen whatever the instructor teach and explain now. It is a huge change of their attitudes compared to the first. They are always motivated to practice , and they are recently seeking for something to improve their abilities. They might seem to enjoy learning new techniques and knowledge of exercise at this time.

Finally, the athletes were satisfied with the current training programs and the training time to spend. The training programs were originally designed for the handball players, and the all programs were created progressively with specific purposes by the instructor. For instance, the training program number one was mainly planned to learn correct exercise motions and patterns. Because of their less training experience, the instructor had to demonstrate correct exercise forms and teach safe techniques. The training program number two included with twisting motions and lateral movements. The instructor modified the second training program because the players require multi-dimensional motions in handball games. The second exercises with multi-planer movements obviously developed their physical abilities contrast to the first exercise program.

In addition, however, the coach and the instructor disappointed one thing of the results that the athletes would teach exercises to new freshmen with minimum confidence next year. IPU has an educational policy 'uniting sports and education' which means that IPU is the school for not only making top athletes but also promoting high-quality skilled coaches and teachers after graduation. Therefore, it must be necessary for the athletes to learn teaching and coaching skills as well as they actually perform exercise at present.

## V. REFERENCES

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Table 1. IPU Men's Handball Team Strength &amp; Conditioning Training Program No.1

**IPU・環太平洋大学 男子ハンドボール部**

Strength & Conditioning Training Program - No.1 - Program Designed by: Kinji Kusumoto, MS, ATC, CSCS

**【 Purpose 】**

- 1) カラダ全体(上肢、体幹、下肢)を鍛え、練習・試合時における怪我を予防する
- 2) スポーツの特性性(ハンドボール)に対応出来るためのカラダづくりを行う
- 3) 基礎動作の理解から応用動作への発展
- 4) 『俺たちは 誰よりも強い!!』という意識と自覚を身につける

**【 Period 】**  
May 31 ~ June 21, 2007 ( 2 times/week X 4 weeks : Tuesday & Thursday )

**【 Programs 】**  
Warm-up: Up

Stretching:

|                                    | Wt. (kg)    | Reps. | Sets | Rest Time |
|------------------------------------|-------------|-------|------|-----------|
| Upper Body:                        |             |       |      |           |
| DB Shoulder Press                  |             |       |      |           |
| WP Upright row                     |             |       |      |           |
| DB Bent Lateral Raise              |             |       |      |           |
| DB Bench Press                     |             |       |      |           |
| DB Fly                             | Over 10     | 10    | 4    | 45 sec.   |
| DB Pull Over                       |             |       |      |           |
| Triceps Extension w/ Shoulder Ext. |             |       |      |           |
| Front Raise                        |             |       |      |           |
| Lateral Raise                      |             |       |      |           |
| Wrist Exercise                     | 2.5         | 2     |      |           |
| Core:                              |             |       |      |           |
| Front Abd                          |             |       |      |           |
| R Side Abd                         |             |       |      |           |
| L Side Abd                         |             |       |      |           |
| Hip Raise                          |             |       |      |           |
| Alternated Leg Ext. & Flex.        | Body Weight | 10    | 4    | 30 sec.   |
| Leg Abd. & Add.                    |             |       |      |           |
| Alternated Arm Ext. & Flex.        |             |       |      |           |
| Arm Abd. & Add.                    |             |       |      |           |
| Lower Body:                        |             |       |      |           |
| Squat                              | Over 20     | 10    |      |           |
| Forward Step Lunge                 | Nc          | 2     |      |           |
| Backward Step Lunge                | Nc          | 2     |      |           |
| Leg Press                          |             | 10    |      |           |
| Leg Curl                           |             | 10    | 3    | 45 sec.   |
| Leg Extension                      |             | 10    |      |           |
| Calf Raise                         | Nc          | 20    |      |           |
| Toe Raise                          | Nc          | 20    |      |           |

Stretching / Cooling-Down

Clean Up

**【 Group 】**  
Group A: Upper Body → Lower Body → Core  
Group B: Lower Body → Upper Body → Core

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Table 3. IPU Men's Handball Team Strength &amp; Conditioning Training Program No.3

**IPU・環太平洋大学 男子ハンドボール部**

Strength & Conditioning Training Program - No.3 - Program Designed by: Kinji Kusumoto, MS, ATC, CSCS, PES

**【 Purpose 】**

- 1) 試合および練習時におけるスポーツ傷害の予防
- 2) 身体サイズアップ (筋肥大)
- 3) クイックリフト(パワーエクササイズ)へ向けての基礎力づくり
- 4) 『俺たちは 誰よりも強い!!』という意識と自覚を身につける

**【 My Goals 】**

**【 Period 】**  
October 18 ~ November 20, 2007 ( 3 times/week X 6 weeks : Tuesday, Thursday, Friday )

**【 Programs 】**  
Warm-up: Up | Body temperature & Motivation to Exercise

Stretching: Static Stretching → Ballistic/Dynamic Stretching

|                                  | Wt. (kg)    | Reps. | Sets | Rest Time |
|----------------------------------|-------------|-------|------|-----------|
| Upper Body:                      |             |       |      |           |
| DB Bench Press                   |             |       |      |           |
| DB Fly                           | Over 10     | 3     |      |           |
| DB Pullover                      |             | 3     |      |           |
| Bench Press                      | Over 40     | 5     |      |           |
| Bent Over Row                    | Over 30     | 5     | 7    | 60 sec.   |
| Kettle Shoulder Exercise (Swing) | 1 & 3       | 6     |      |           |
| Dead Lift                        | Over 30     | 6     |      |           |
| Gorilla w/ Kettle ball           | 1 & 3       | 6 X 3 |      |           |
| Wrist Curl Exercise              | 2.5         | 2     |      |           |
| Lower Body:                      |             |       |      |           |
| Squat                            | Over 40     | 6     |      |           |
| Machine Leg Press                |             | 6     |      |           |
| Power Step Front Lunge           | Nc          | 2     | 8    | 60 sec.   |
| Tue Raise                        | Nc          | 30    |      |           |
| Calf Raise                       | Nc          | 30    |      |           |
| Plyometric:                      |             |       |      |           |
| Squat Jump                       |             | 15    |      |           |
| Split Jump                       |             | 10    |      |           |
| Single Leg Hop                   | Body Weight | 2     | 2    | 60 sec.   |
| Single Leg Side Jump             |             | 2     |      |           |
| Task Jump                        |             | 5     |      |           |
| Depth Jump                       |             | 5     |      |           |
| Core:                            |             |       |      |           |
| 10 Core Exercise                 | Nc          | 10    | 2    | 30 sec.   |
| Cardio:                          |             |       |      |           |
| ①Normal ②Knee Up ③Heel to Heel   | Nc          | 15:15 | 1    | 30 sec.   |

Stretching / Cooling-Down

Clean Up


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Table 2. IPU Men's Handball Team Strength &amp; Conditioning Training Program No.2

**IPU・環太平洋大学 男子ハンドボール部**

Strength & Conditioning Training Program - No.2 - Program Designed by: Kinji Kusumoto, MS, ATC, CSCS

**【 Purpose 】**

- 1) 試合および練習時におけるスポーツ傷害の予防
- 2) 体幹の軸を崩さないための「回旋動作」や「横移動」の習得
- 3) 『俺たちは 誰よりも強い!!』という意識と自覚を身につける

**【 Period 】**  
July 10 ~ August 14, 2007 ( 3 times/week X 6 weeks : Tuesday, Thursday, Friday )


**【 Exercise 】**  
Warm-up: Up | Body temperature & Motivation to Exercise

Stretching: Static Stretching → Ballistic/Dynamic Stretching

|                                   | Wt. (kg)             | Reps. | Sets | Rest Time |
|-----------------------------------|----------------------|-------|------|-----------|
| Upper Body:                       |                      |       |      |           |
| DB Shoulder Press w/ R. Twisting  |                      | 10    |      |           |
| DB Shoulder Press w/ L. Twisting  |                      | 10    |      |           |
| WP Upright Row w/ R. Twisting     |                      | 10    |      |           |
| WP Upright Row w/ L. Twisting     |                      | 10    |      |           |
| 3 Way Motion Gorilla (Low)        |                      | 5     |      |           |
| 3 Way Motion Gorilla (Middle)     |                      | 5     |      |           |
| 3 Way Motion Gorilla (High)       |                      | 5     |      |           |
| DB Bench Press                    | Over 10              | 5     | 3    | 30 sec.   |
| DB Fly                            |                      | 10    |      |           |
| DB Pull Over                      |                      | 10    |      |           |
| Shoulder Full ROM of Ext. & Flex. |                      | 10    |      |           |
| Wrist Exercise                    | 2.5                  | 4     |      |           |
| Lower Body:                       |                      |       |      |           |
| Squat                             | Over 30              | 15    |      |           |
| Walking Front Lunge               | Nc                   | 2     |      |           |
| Walking Back Lunge                | Nc                   | 2     |      |           |
| R Side Step Squat                 | Nc                   | 1     |      |           |
| L Side Step Squat                 | Nc                   | 1     |      |           |
| Leg Press                         |                      | 10    |      |           |
| Leg Curl                          |                      | 10    | 3    | 30 sec.   |
| Leg Extension                     |                      | 10    |      |           |
| Calf Raise                        | Nc                   | 30    |      |           |
| Toe Raise                         | Nc                   | 30    |      |           |
| Core:                             |                      |       |      |           |
| Front Abd                         |                      |       |      |           |
| R Side Abd                        |                      |       |      |           |
| L Side Abd                        |                      |       |      |           |
| Crunch                            |                      |       |      |           |
| Crunch w/ torso twisting          | Body Weight          | 10    | 2    | 30 sec.   |
| Hip Raise                         |                      |       |      |           |
| Alternated Leg Ext. & Flex.       |                      |       |      |           |
| Leg Abd. & Add.                   |                      |       |      |           |
| Arm Abd. & Add.                   |                      |       |      |           |
| Ladder Training:                  |                      |       |      |           |
| Quick Run                         |                      |       |      |           |
| R Lateral Sprint                  |                      |       |      |           |
| L Lateral Sprint                  |                      |       |      |           |
| in-out                            |                      |       |      |           |
| Open-Close Jump                   |                      |       |      |           |
| R Side Jump                       |                      |       |      |           |
| L Side Jump                       |                      |       |      |           |
| in-out-out                        |                      |       |      |           |
| Cardio Training:                  |                      |       |      |           |
| Normal                            |                      |       |      |           |
| Knee Up                           | (15 sec: 15 sec) X 3 |       | 1    | 90 sec.   |
| Heel to Buttock                   |                      |       |      |           |

Stretching / Cooling-Down

Clean Up

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