

Developing FIVE[®] Neuromuscular Warm-Up As Futsal Injury Prevention Program

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Abstract—futsal is popular sports with high incidence of injury especially in young players. Research showed that neuromuscular warm up which consist of warm up and stretching combined with several conditioning exercises could reduce the incidence of injuries. This study aims to develop specific neuromuscular warm-up as futsal injury prevention program. Need Analysis study conducted to review the injury epidemiology of futsal and the effectiveness of various exercise program on preventing injury. The results of the literature study used to develop the futsal specific neuromuscular exercise to reduce injury. Six expert persons from sports medicine doctors, AFC licensed futsal coach, and strength and conditioning coach participated to evaluate the draft of the program. Futsal specific neuromuscular warm-up has developed based on literature studies and experts judgment. This program called FIVE (Futsal Injury Prevention Program and Enhance Performance). The FIVE program focuses on warm-up, stretching, strengthening, plyometric, agility and balance which emphasized on futsal characteristics (high intensity sports with multiple sprints and multiple movement direction). The further experimental research needed to evaluate the effectiveness of the futsal neuromuscular warm-up program in reducing injury.

Keywords—neuromuscular warm up, futsal, injury, prevention.

I. INTRODUCTION

Futsal is one of the most popular sports in Indonesia. It is considered as a derivative sport of football and has grown rapidly in the last two decades. Moreover, after Indonesia hosted the Asian Asian Football Confederation (AFC) Futsal Championship in 2002.

Futsal is mostly played by young people, especially among high school and college students as leisure time physical activity. In fact, this is in line with government program, especially issued by Ministry of Health, in order to reduce the burden of health costs by having active lifestyles. As well as the Ministry of Youth and Sport's program through the "Let's Exercise" movement.

In terms of sports achievement, the number of young players will cause increased number of futsal players to compete professionally. The increasing accomplishment made through this sport is also quite good. The latest data shows Indonesian futsal team is ranked 50th in the world, ranked 10th in Asia and ranked 3rd in Southeast Asia

As a popular sport it has dilemmatic choices. Research shows that futsal is a sport that has a high incidence of injury,

especially in young players [1, 2]. Low level of musculoskeletal fitness and muscle imbalance are the cause of the high number of injuries in young futsal players [3, 4]. Providing exercises to improve physical fitness has been proven to lower the risk of injury to young players [5, 6].

Neuromuscular warm up program can reduce the risk of injury. This program combines warming up and stretching with several components of exercise that can improve muscle strength, power and balance. This exercise is very practical. It does not require any additional equipment and can be applied in every training session. The development of a FIFA 11+ neuromuscular warm up program in football through the FMARC (FIFA-Medical Assessment and Research Center) has been proven to reduce the incidence of injuries to football athletes [7, 8].

Considering the high incidence of injuries in futsal, especially to young players, a program is needed to reduce the incidence of injury through physical fitness. As far as researchers are concerned, there has never been a development of an injury prevention program through development of specific neuromuscular warming for futsal.

This study aims to develop a neuromuscular warm up design that is structured as an injury prevention program in futsal sports. The designed program is expected to be implemented in a practical and easy way without any additional tools in every futsal training session. The program will be introduced to coaches, players and futsal practitioners through an education and learning media (manuals, posters, booklets and videos).

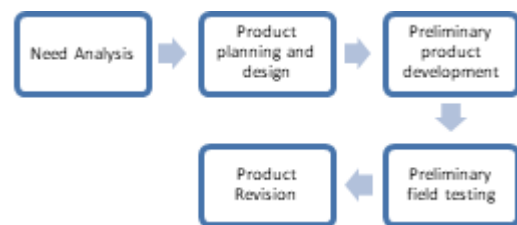


Fig. 1. Research Stages for designing the FIVE Model

II. METHOD

A. Study Design

This is Research and Development (R & D) study design from Borg and Gall to create a prototype/model of product. The steps taken in this study can be seen in Figure 1.

B. Need Analysis

Literature studies showed that futsal has a high incidence of injury, especially in the lower extremities (ankle, knee, and hamstring). Injuries mostly occurred among young athletes caused by inadequate muscle imbalances, muscle weakness and techniques [3].

Literature studies also showed that neuromuscular warm up which combine standard warming up (warm up and stretching) and some conditioning exercises can correct muscle weaknesses and improve musculoskeletal fitness [7]. Neuromuscular warm up has been developed in several sports such as FIFA 11+ for football, Performance Enhancement Program (PEP) for basketball, and HarmoKnee in the military population that apparently turned out to be able to reduce the incidence of injury in this population.

Systematic Review shows some components that can significantly reduce the factors causing injuries are in forms of trainings (1) strengthening (2) plyometric (3) balance and (4) agility & coordination [9].

The initial design of the product is by combining futsal standard warming up which consists of warm up and dynamic stretching with injury prevention components consisting of strengthening, plyometric, balance, agility & coordination. The initial product focuses on core correction and lower extremities since most futsal injuries (70-80%) occur in those parts [1, 2].

C. Product Planning and Design

The initial product design is named FIVE, which stands for Futsal Injury Prevention and Enhance Performance. FIVE consists of 5 components of neuromuscular warm up which consisting of (1) Cardiovascular warm up (2) Dynamic Stretching (3) Strengthening (4) Balance, Plyometric & Agility (5) Prepare to play (with the Ball). FIVE is recommended to be implemented 2-3 times a week on 12 weeks routine exercise to get optimum results. 2-3 times a week is a recommendation for weight training/ resistance for beginners (ACSM & NSCA), and 12 weeks is the ideal time of muscle adaptation given weight training. It is expected that after 12 weeks of practice, FIVE exercises can result in expected benefits.

FIVE can still be implemented as a warm-up during match without applying part 3 (Strengthening), because this component can cause fatigue which can affect the game result.

D. Preliminary product development

The initial product design/draft was then developed into a series of training programs adapted to field condition and the goal of this research (injury prevention program). The development of this product was updated FIVE program which is (1) customized to the characteristics of futsal sports (2) in accordance with the warming up time rules of 15-20 minutes (3) applicable for any futsal team because it only requires balls and cones (without training aids such as: wobble board, rubber exercises, etc.) (4) Having customized number

of sets and repetitions in line with rules of the weight training program and the time available. Here are the details of each part in the FIVE exercises:

Part 1: Cardiovascular warm up

Jogging

Jogging will help to prepare the cardiovascular system and increase body temperature to exercise

Part 2: Dynamic stretching

a. Hip in - Hip Out:

Stretching for inner and outer side thigh muscles.

b. High Heel - But Flicks

Stretching for gluteus, hamstrings and quadriceps muscle.

c. Smooth Swing Carrioca

Stretching for the hip and thigh muscle

d. Groin - Hamstring Swing

Stretching for the groin and hamstring muscles

Part 3: Strengthening

a) Plank

Strengthens the muscles of the core muscle

b) Side Plank

Strengthens the muscles of the (side) core muscle

c) Nordic hamstring

Strengthens hamstring muscles

d) Bounding side

Strengthens thigh and hip muscles

e) Squat

Strengthens gluteus and thigh muscles

f) Copenhagen exercise

Strengthens hip, groin and hamstring muscles

Part 4: Balance, Agility & Coordination

a) Dynamic body contact

Exercise to improve coordination and balance especially when contact with opponents. Futsal often involves body contact which causes a player to lose balance and eventually fall. This exercise serves to train players to maintain balance and center of gravity when there is movement, change in direction, or force from the opponent

b) 4-types agility training

This exercise consists of 4 types of agility training (sudden accelerations) and coordination (turning the direction, walking backwards) so that there is no motion error when playing futsal.

Part 5: Prepare to play (with the Ball)

This section is the last part of the FIVE. Players are prepared to perform a specific futsal movement such as passing, front dribbling, back dribbling, running with the ball and man to man marking.

E. Preliminary field testing

Initial product trials were carried out through Focused Group Discussion (FGD) experts with expertise on testing / assessing the initial FIVE products that had been developed. Experts consisting of 2 sports medicine specialists, 2 sports science lecturer (licensed strength and conditioning coaches) and 2 licensed AFC Futsal coaches (former Indonesia futsal national team coach).

F. Revision

The product was revised according to the input of the expert team. The revised parts according to experts recommendation was (1) adding training components, (2) changing the sequence of exercise components (3) adjusting the number of sets & repetitions in the exercise (4) emphasis on correct movement techniques in each component of the exercise.

III. RESULTS

The final product of FIVE can be seen in:

<https://www.youtube.com/watch?v=je-6FrXlwCs&t=18s>

IV. CONCLUSION

This research has produced a specific neuromuscular warming up model for futsal sports called FIVE (Futsal Injury Prevention Program and Enhance Performance). This exercise is prepared based on literature review and input of various related experts. Further research is needed to look at the effectiveness of the FIVE program in reducing the incidence of injuries to futsal players, especially young and amateur players.

ACKNOWLEDGMENT

Research Grant from Ministry of Research, Technology and Higher Education of the Republic of Indonesia supported this work.

REFERENCES

- [1] A. Junge dan J. Dvorak, "Injury risk of playing football in futsal world cups", *Br J Sports Med.*, vol. 44, no. 11, pp. 787-793, 2010.
- [2] S.L. Schmikli, F.J. Backx, H.J. Kemler, W. van Mechelen, "National survey on sports injuries in the netherlands: target populations for sports injury prevention programs", *Clin J Sport Med.*, vol. 19, pp. 101-6, 2009.
- [3] N.R. Rodigro, O.P.C. Leonardo, "Epidemiologic analysis of injuries occurred during the 15th Brazilian indoor soccer (futsal) sub20 team selection championship", *Rev Bras Med Esporte*, vol. 12, pp. 1-5, 2006.
- [4] Domingues, S.Pd.T., M. Conte, E.F. Mas., Ramalho, L.Cd.B., V.J. de Godoi, L.F.M. Teixeira, et al., "Implication of physical fitness level on sport injury", *Rev Bras. Cineantropom. Desempenho Hum.*, vol. 7, no. 2, pp. 29-35, 2006.
- [5] B.R. Mandelbaum, H.J. Silvers, D.S. Watanabe, J.F. Knarr, S.D. Thomas, L.Y. Griffin, et al., "Effectiveness of a neuromuscular and proprioceptive training program in preventing anterior cruciate ligament injuries in female athletes: 2 years follow up". *Am J Sports Med.*, vol. 33, pp. 1003-1010, 2005.
- [6] I. Jeffreys, "Developing a progressive core stability program", *Strength Cond J*, vol. 24, no. 5, pp. 65-6, 2002
- [7] T. Soligard, G. Myklebust, K. Steffen, I. Holme, H. Silvers, M. Bizzini, et al., "Comprehensive a warm-up programme to prevent injuries in young female footballers: cluster randomized controlled trial", *Clin J Sport Med.*, vol. 19, pp. 509-10, 2009.
- [8] A. Junge, M. Lamprecht, H. Stamm, H. Hasler, M. Bizzini, M. Tschopp, et al., "Countrywide campaign to prevent soccer injuries in swiss amateur players", *Am J Sport Med.*, vol. 39, no. 1, pp. 57-63, 2011.
- [9] K. Herman, C.Barton, Malliaras, D. Morrissey., "The effectiveness of neuromuscular warm up strategies, that require no additional equipment, for preventing lower limb injuries during sports participation : a systematic review", *BMC Med.*, vol 10, no. 75. 2012.