Effect of balance training, plus black seeds capsules on Knee joint injuries, balance and performance

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Abstract: This study was designed to investigate the effects of balance training, plus black seeds capsules on knee joint injuries, balance and performance. Materials and Methods: Thirty students from Banha Univ. volunteered to participate in the study, they were affected with knee joint injuries (strain, sprain), aged (19-22y). They were divided to three groups each of 10 students, balance training group, balance training with black seeds capsules (200mg/daily), control group. The training course run for one hour a day, four days weekly and lasted 3 months. Control group did not participate to the training. Tests were performed at baseline and after 3 months: vertical jump, isometric lower limb extension 5 huttle run, balance test, knee joint range motion. The results suggest neuromuscular adaptation and activation of proprioceptors leading to improved balance, range of motion and performance in case of balance training group plus black seeds capsules compared to balance training alone or control group.

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Introduction

Postural equilibrium needs proprioceptive acuity and precise neuromuscular control. Proprioception is the afferent information that contributes to conscious sensation (muscle sense), total posture (posture equilibrium), and segmental posture joint stability. (Lephart, 1997) Some studies have shown that diminished proprioception is a major contributing factor to falls in the elderly (Mion et.al, 1989). One strategy to reduce the incidence of poor proprioception and falls with aging may be regular activity (Petrella et al., 1997). Exercise can help to improve a number of sensorimotor systems that contribute to stability (Lord et al., 1999). However, different forms of exercise may have different effects on postural equilibrium. Gauchard et al., (2001) reported that proprioceptive exercise appeared to have a greater effect on balance control than bioenergetics physical activities.

Palmieri et al, (2003) studied the effect of a simulated knee joint effusion on postural control in healthy subjects and concluded that possible explanations for the improved postural control after the effusion include additional somatosensory feedback, an augmented neural drive to the soleus and increased capsular tension.

Black seed capsules (200 mg) were ingested once daily for 12 weeks, its therapeutic benefits are largely due to its volatile oil and oleoresm content, Black sees highly effective for motion sickness it is recommended conventional remedy for rheumatic and musculoskeletal disorders, the ameliorative effect of black seeds in arthritis, muscular discomfort, tendonitis, sciatica and gout including marked reduction in pain, swelling, inflammation and stiffness, Black seeds mechanism of action as analgesic, anti-rheumatic and anti- inflammatory is explained by reducing the formation of oxygen radicals, and regulation of PGS, LTs, Taxs biosynthesis (Grzanna et al., 2005).

This study was therefore designed to investigate the effects of balance exercise capsules on knee joint injuries, balance and performance.

Materials and methods:

Subjects and study design:

Thirty students from Banha University volunteer to participate in the study.

30 experiment students with knee joint injuries (strain, sprain) aged (19-22 years), they were randomized to proprioception exercise group (n=10), proprioception exercise plus blackseeds capsules (200 mg daily) group (2) control group (n=10).

The proprioception training involves balance exercises. These exercise help to train the proprioceptive system with an early emphasis on static activity. Basic proprioceptive exercises involve single leg balance on a stable surface.

An element of instability is provided by progressing from a hard surface to a soft surface such as foam pad. Also the incorporation of functional and sport activities, increasing the difficulty of the proprioceptive skills, and facilitate the progress toward return to sport. A comprehensive rehabilitation program for the knee injuries should incorporate not only the traditional interventions such as strength, flexibility and range of motion, but also include

activities designed to enhance agility, proprioception and neuromuscular control, in addition, proprioceptive training can play an important role in primary injury prevention and help the individual to return to preinjury levels of activity and reduce the risk of reinjury upon return to sport.

Criterion for selection of the patient studied for identification of the target criterion for the main test, a pilot study was conducted:

5 patients for each group of study and placebo therapy for group 2.3. Patients who fell into the following categories were excluded from this study:

a. Patients with joint injuries on both sides or with multiple joint injuries the same side.

b. Patients with prior injuries at the same joint within six months before the test began.

d. Patients with bone fractures.

e. Patients with degenerative pre-damaged joints, chronic joint disorder or post operative joint

f. Patients in poor physical condition.

The proprioception exercises for the injured knee individuals (n-20) run for at least one hour a day for four days weekly and lasted 3 months. The control group (n = 10) did not participate in any training. The baseline characteristics of the three groups are indicated in table (1), all participants gave their informed written consent before enrollment, and the training protocol was done in sport Hall of Benha University. Baseline characteristics of the three groups are indicated in table (1).

Performance tests:

5 Minutes warm - up was performed before each test; the subjects wore the same shoes during the three performance tests.

A vertical jump test was performed to assess the lower limb explosive performance capacity, on a contact plat form to measure the flying time, which is used to estimate the height of the rise of body center of gravity. Maximal isometric strength of the leg extensors was measured with a dynamometer.

A shuttle run test over a 30 m course was used, the subjects were asked to run as fast as possible six times between markers placed 4 m apart., and run a 6 m course over the finish line, the running time was recorded.

Balance test was performed using Biodex stability system (Schmitz and Arnold, 1998). The platform provides stability - levels, this system provides a numerical stability index that reflects the body sway variation around the body's center of gravity. Also knee joint motion range was performed for all subjects.

Table 1. Baseline characteristics of the three groups

Parameters	Group(l)	Group(2)	Group(3)
Age(y)	19.63+1.2	20.+0.9	21.2 ±**1.1**
Weight (k)	71.34+3.4	72.4±4.2	70.9±3.8
Height (cm)	174.6 + 5.6	176.8±6.1	175.4+7.2
BMI(kg/m^2)	23.1+3.0	22.7 + 2.4	24.0 ±2.2

Group 1 = proprioception exercise plus Black seed capsules
Group 2 = proprioception exercise only Group 3 = control

Statistical analysis.

A one - way Anova was used to test for baseline differences among proprioception exercise group and proprioception exercise plus Black seed capsules group and control group. The effects of the interventions were analyzed by means of repeated measures ANOVA. The level of significance was set at $P < 0.05$ Table 2 strength, balance and knee joint range of motion in three groups at baseline and 3 mouths intervention.

Table 2. Strength, balance and knee joint range of motion in three groups at baseline and 3 mouths intervention

Parameters	Exercise + Black seed group (1)	**%** Benefit	Exercise only group(2)	% **Benefit**	**Control group(3)**	% Benefit	P Value
Vertical jump (cm) Baseline At *3* month	29.9 ±1.9 33.5 ±2.4	12	29.5 ±3.4 30.9 ±3.6	4.7	27.8 ±2.7 28.1 ±2.3	1.1	52.2
Isometric lower Limb extension (k) Baseline At 3 month	191.7+20.3 201.2±21.6	4.9	192.3±24.5 197.3±99.8	2.6	193.3±31.1 196.4±26.3	1.6	12.4
Shuttle run (s) Baseline At 3 month	12.2 ±1.4 10.1 ±1.6	20.8	12.0+2.1 10.8±1.8	11.1	12.6 ±1.3 12.3 ±1.2	2.4	22.9
Balance test (stability) Postural way Baseline At 3 month	3.4+1.6 3.0+1.4	13.3	3.7+1.7 3.5 + 1.5	5.7	3.6+1.9 3.5 + 1.2	2.9	3.9
Knee joint Range motion (degree) Baseline 3 month	133 ±18.4 164.3±21.2	**23.4**	129.2±197 151.4+18.2	17.2	131.5±20.2 146.1+17.3	4.1	25.4

Mean (SD) table. F (0.05) = 3.35 all values at baseline are non significant (F) values are significant between different treatments after 3month.

3. Results:

Strength tests: the vertical jump height results revealed an increased value (33.5+2.4) in case of the 1st group compared with group *<2)* (30.9 + 3.6) and control (28.1 + 2.3) after 3 months intervention (table 2) isometric lower limbs extension strength improved (201.2+21.6) group(l), as for group(2) (197.3+19.8) and control (196.4+26.3) (table2) after 4 months intervention As for shuttle run tests, the most benefits occurred to group(l) (10.1 +1.6), than group(2) (10.8+ 1.8) and group (3) (12.3 ±1.6).

Balance test: the improvement occurred in the postural sway at 4 months test, to group (1) (3.0 + 1.4), followed by group (2) than control (3.5 + 1.5) (3.5+ 1.3) The knee joint range of motion was higher for group (1) (164.3 + 21.2) than group (2) (151.4+18.02) and control (146.1 + 17.3) after 4 month intervention.

4. Discussion:

The vertical jump determined in this study (table 2) is similar to the value published by Torvinen et al, (2002), however, it is less than the value published by Sevim et al, (1997) and Oduz and Sevin (1992). The possible cause to the significant. increased (52.27) in vertical jump of the proprioception exercise plus *Black seed* group(l) compare to proprioception exercise group(2) and control group (3) might be due to the effect of exercise plus the capsules which cause an increase in the recruitment of the motor units through activation of proprioceptors as muscle spindles and Golgi apparatus of tendons.

Shuttle run norm value presented in this study, indicated a significant low value (P 22.89) in seconds in case of group 1, compared to group (2) and group(3) (table 2), one could suspect that the improvement in the shuttle run was because of the proprioception exercise and black seed capsules, which might lead to small changes in muscle strength and a tonic excitatory influence on the muscles (Seidel, 1988). Shuttle run norm values were in accordance with that of Backer et al., (1993) and Torvinen et al., (2002). The lower - limb extension strength increased after 3 months of proprioception exercise and black seed capsules (p = 12.39) (table 2) compared to exercise alone or control group. This might be to the neural potentiation of proprioception exercises and black seed capsules, which affects muscle power and strength of functional performance (Rubenstein et al., 1994).

Considering the effects of proprioception exercises plus black seed capsules on balance, stability index (postural sway), Table (2) indicated a significant Decreased stability index (p = 3.89) while proprioception exercises alone and control group revealed no marked changes, from a neurophysiological perspective, balance involve the interaction of different levels of balance control mechanisms, so balance is related to the inertial forces acting on the body and the inertial characteristics of body segments (Nashner, 1997). Muscle spindle, Golgi tendon organ and pacinian corpuscles work in harmony by releasing Segmental reflexes and mediating information on balance changes to the CNS (Prochazka and Hullinger, 2013). Information derived from receptors located in cutaneous and subcutaneous tissue of the sole of the foot can detect changes in pressure for example postural sway (Toppila and Pykko, 2000). Baloh et al., (1993) added that the vestibulo - ocular reflex stabilize vision by producing eye movements in opposite directions during the turning of the head, through this phenomenon the vestibulo- spinal reflex stabilizes the whole body.

It should, however, be remembered that comparisons of the age and sex reported in different studies are complicated due to differences in method, age, study design (Rogind et al., 2003).

The results of our study suggest neuromuscular adaptation and activation of proprioceptors leading to improved balance of group (1).

Data presented in table (2) revealed an improvement in the range of motion of knee joint injuries after proprioception exercises plus black seed capsules administration, compared with exercise only and control groups (P = 25.4) such improvement in the range of motion of the knee joint indicated the benefits induced by the training program and black seed capsules administration. Lephart et al, (1997) reported that postural equilibrium need proprioceptive acuity and precise neuromuscular control,. Proprioception is the afferent information that contributes to conscious (VOJKO, 2002).

Sensation (muscle sense), total posture (postural equilibrium) and segmental posture (joint stability). Xu et al., (2004) pointed out that the ritual motions of tai chi exercise are proprioceptive exercise and added that tai chi exercise are performed in a semi squat position, which enhances the loading of the muscles and motion range of the knee joints, which may be valuable for maintaining balance control.

Robergs and Roberts (1997) reported that flexibility is defined as the range of motion (RDM), they added that factors that influence flexibility are:

The bone structure and ligaments of the joint, the amount of bulk surrounding the joint, tendon elasticity, injuries, connective, tissue structure, age, gender and life style.

Black seeds studies indicated scientific support for the long held belief of its anti inflammatory properties as it suppresses prostaglandin synthesis and suppresses Leukotriene biosynthesis by inhibiting 5-lipoxygenase. These dual inhibitors of cycloxygenase and 5- lipoxygenase may have a better therapeutic profile and fewer side effects than non steroidal anti-

inflammatory drugs, also it inhibits the induction of several genes involved in the inflammatory response, and these include genes encoding cytokines, chemokines and the inducible enzyme cyclooxygenase - 2. All these actions may be valuable for a benefit effect to the muscles and motion range of the knee joints, which may maintain balance control (Pham et al., 2005, Grzanna et al., 2005, Grzanna et al, 2004, Kim et al., 2005).

Enhancing proprioceptive quality & adaptation:

The following exercises and body systems have an effect on proprioceptive awareness.

* Movement for movement's sake in any variety of movement patterns and ranges of motion with different tensions/loads (i.e., dancing, tai chi, yoga).
* Traditional cardio, strength and flexibility conditioning.
* Balance conditioning, eyes open and closed.
* Rotational movements (not just linear and lateral).
* Visual acuity: Use vision to adjust movements when recovering balance. Instead of focusing downward, look ahead to realign the head and neck.
* Auditory system: The inner ear registers head and body movement like a built-in level. To function properly, the head and neck must be situated over a balanced spine.
* Rhythm: Heart beat, breathing patterns and even walking are rhythmic by nature. Have clients strive to feel rhythm during sports and as they work out.
* Stance: Movements should be initiated from an "athletic stance" (ankles, knees and hips slightly flexed) and an upright posture. Stance is also referred to as the clients' "base of support," or the distance created between their feet.
* Weight transfer: Bodies are especially sensitive to weight changes that take place with stance or postural shifts. Clients will feel weight transfer from the feet upward.
* Constant motion: Have clients get a feel for constant, dynamic movements (versus static positions) as they try the drills mentioned in this article.

Conclusion:

proprioception exercise; Plus –black seeds might improve balance joint stability and performance and the capsules posses broad anti inflammatory actions.

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