Comparative Myoelectric Evaluation of a Commercially-performed Versus a Traditionally-performed Abdominal Exercise

Raymond Leung[1], Howard Zeng[1], Xinran Hu[2], Phoebe Ho[3], Sunny Fong[4]

[1]*Department of Physical Education and Exercise Science, The City University of New York–Brooklyn College, Brooklyn, NY, USA*

[2]*University of Southern Indiana, Evansville, IN, USA*

[3]*Oasis Fitness, Central, Hong Kong SAR, CHINA*

[4]*Mind and Body Fitness–Sun Sports International, West Concord, MA, USA*

In recent years, various commercial abdominal exercise machines have been heavily promoted and advertised through frequently aired infomercials on television; however, the effectiveness and safety of those devices are questionable. The present independent study was designed to evaluate if there were any differences in myoelectric activities assessed by means of surface electromyography between abdominal exercises as performed on a commercially available machine, the AbRoller, and a traditionally performed crunch. A total of 31 non-obese participants (age: 21.6 ± 4.5 years; mass: 66.4 ± 6.8 kg; height: 161.9 ± 8.4 cm) volunteered to participate in the study. Each participant performed four repetitions of abdominal exercises with ankles stabilized and four repetitions of equivalent exercises without ankles stabilized on both the AbRoller and the traditional crunches. During the executions of the four forms of abdominal exercises, the relative peak and mean myoelectric activities of the rectus abdominis, rectus femoris, sacrospinalis, and sternocleidomastoid muscles were measured. Repeated measures two-way ANOVA and paired *t* tests were employed to determine if differences in the relative peak and mean myoelectric data existed between the AbRoller and the traditional abdominal exercises. With respect to the rectus abdominis, rectus femoris, and sacrospinalis muscles, no significant differences ($p > 0.05$) in the relative peak and mean myoelectric activities between the AbRoller-performed and the traditionally performed abdominal exercises were found. Abdominal exercises performed using the AbRoller resulted in significantly lower ($p < 0.05$) relative peak and mean myoelectric activities than those of the traditional crunches within the sternocleidomastoid muscle. With ankles stabilized, the relative peak and mean myoelectric activities of the rectus femoris muscle were significantly greater ($p < 0.05$) than the abdominal exercises without ankles stabilized regardless of exercise mode. In conclusion, the use of the AbRoller appears to be effective in recruiting the abdominal muscles and also safe in not excessively activating the unwanted hip flexor muscles. Independent of the mode of exercise, all abdominal exercises should be performed without ankles stabilized to minimize the undesirable involvement of the hip flexors.

Keywords: abdominal exercise, hip flexor, myoelectric activity

Corresponding Author
Howard Zeng, Department of Physical Education and Exercise Science, Brooklyn College of The City University of New York, 2900 Bedford Avenue, Brooklyn, New York, 11210-2889, USA.
Tel: (1) 718 951 4427
Fax: (1) 718 851 4541
E-mail: HZeng@brooklyn.cuny.edu

Introduction

In recent years, many commercially available abdominal exercise machines have become popular. Some companies have sold more than 90,000 of a single apparatus and made over US$14 million from their sales on an annual basis (Australian Competition and Consumer Commission 2003). These machines were heavily promoted in television commercials, on Internet websites, product catalogues, newspapers and magazines, and retail outlets. The companies sold their machines through frequently aired infomercials on national television stations such as USA and TNN in the United States and Network Ten and Bright Ideas programs in Australia. The infomercials usually feature fitness and health care professionals who employ pictures of models' sculpted midsections and user testimonials with purported expert opinions to encourage and convince consumers to purchase their abdominal exercise machines (Federal Trade Commission 2005, 2002). Most commonly, the advertisements for the abdominal exercise machines include claims that their devices are safe for all users, and will give them well-defined abdominal muscles such as "rock hard", "six pack", or "washboard" abdominals; and the use of their machines is equivalent to traditional abdominal exercises such as sit-ups or crunches. Some advertisements even suggest that a 10-minute use of their machines would be equivalent to up to 600 sit-ups (Australian Competition and Consumer Commission 2003).

Nevertheless, lawsuits related to false claims made by the marketers of these advertised abdominal exercise machines have recently been increasing. In some cases, settlements against the abdominal exercise machine manufacturers or companies are enormous, involving a huge amount of legal costs. Consequently, these abdominal exercise machines are so questionable that the Federal Trade Commission launched a project against the makers of some machines (Federal Trade Commission 2002). In one case, the charge against a manufacturer included a US$41.5 million judgment (Federal Trade Commission 2005, 2004). Under the settlements, the marketers and certain retailers collectively paid over US$ 2 million, of which over US$1.4 million was for consumers. The Federal Court declared that some of the advertising claims about the benefits of the machines were misleading or deceptive to consumers (Federal Trade Commission 2005, 2004). In addition, The Australian Competition and Consumer Commission has also recently brought actions against a number of abdominal exercise machine makers. Similar lawsuits and charges against abdominal exercise machine companies were filed by the Australian Competition and Consumer Commission (Australian Competition and Consumer Commission 2003, 2002; National Council Against Health Fraud 2002).

As a result, examinations of the abdominal exercise machines are crucial to offer objective scientific answers to the public so that they can be well informed of the use of these exercise equipment. The objective of the present independent scientific study was therefore to evaluate whether a selected commercial abdominal exercise machine, the AbRoller, was effective and safe as compared with a traditional crunch. Specifically, the study was designed to assess whether there were any differences in the peak and mean myoelectric activities of the rectus abdominis (i.e. the prime longitudinal abdominal muscle), rectus femoris (i.e. the surface hip flexor muscle), sacrospinalis (i.e. the lower back muscle), and sternocleidomastoid (i.e. the neck flexor muscle), between abdominal exercises as performed on the AbRoller relative to those performed traditionally.

Methods

Participants

Thirty-one non-obese individuals aged from 16 to 35 years volunteered to participate in the study. Among the participants, 16 were male (body mass: 73.6 ± 7.1 kg; height: 178.5 ± 10.1 cm) and 15 were female (body mass: 56.2 ± 6.2 kg; height: 155.9 ± 6.3 cm). In order to control for the participants' body composition which would affect the range of motion of trunk curl during testing, each participant was required to meet the non-obese criteria including body mass index < 30.0 kg m^{-2} and waist circumference < 1.02 and 0.88 m for males and females, respectively, as suggested by the American College of Sports Medicine (ACSM) guidelines (ACSM 2006). Prior to the study and data collection, the details of the study were explained to the participants and they were asked to complete an informed consent form. The participants were also required to complete a medical history form to provide any medical contraindication background information. Participants reporting any history of acute and chronic low back pain and other contraindication to exercise as suggested by the ACSM guidelines (ACSM 2006) were not included in the study. Participants were instructed to refrain from abdominal exercises for 48 hours before data collection. Any participant not completing all test sessions was excluded from data analysis.

Methodologic testing procedures

After the testing procedures were detailed to the participants, they were instructed to perform the following two forms of abdominal exercises using the AbRoller and the traditional crunch: (a) both ankles of the participant were stabilized by a test administer; (b) both ankles of the participant were left unstabilized. Therefore, a total of four forms of abdominal exercises were examined. The participants were then given 10 minutes to familiarize themselves with the use of the abdominal exercise machine and to practice different forms of abdominal exercises. Particular emphasis was given to the participants that they should maintain slow, constant, and rhythmic movements with no jerking throughout all forms of abdominal exercises. The participants were also asked to maintain a constant angular velocity during the entire range of motion in each repetition of an abdominal exercise and to resume a complete supine position before the next repetition began. A diagram of the AbRoller is displayed in Figure 1.

After the familiarization period, participants were prepared for myoelectric electrode placements and attachments. The electrode placement locations were determined with palpation to establish electrode placement landmarks. The hairs around the electrode locations were shaved and the skin wiped with alcohol and abraded with cotton gauze to lower cutaneous electrical resistance. Silver/silver chloride disk surface electrodes (Model 2258; Medical-Surgical, St. Paul, MN, USA) with a diameter of 8 mm were placed in parallel to the muscle fibers being tested in a bipolar configuration for myoelectric recording. The surface electrodes were then applied to the muscles to be examined. Regarding the rectus abdominis which is the prime longitudinal abdominal muscle, the electrodes were located to the right of the midline and 3 cm lateral to the umbilicus (Guyton & Hall 2006; Moore & Agur 2006). For the rectus femoris which is the surface hip flexor muscle, the electrodes were positioned along the muscle belly converging on the quadriceps tendon which extended to the patella and continued as the patellar ligament and inserted on the tibial tuberosity. With respect to the sacrospinalis, which is the lower back muscle, the electrodes were positioned 3 cm lateral to the spine at the level of the third lumbar vertebra. With regard to the sternocleidomastoid which is the neck flexor muscle, the electrodes were placed midway between the mastoid process of the occipital bone and the sternoclavicular joint (Guyton & Hall 2006; Moore & Agur 2006). A ground electrode for all measurement channels was located on the right acromion. All electrode sites were positioned on the right side of the body midline to ensure consistent measurements. Cross talk was minimized by placing the electrodes as close as possible to each other provided that no overlapping of any electrode components occurred. To ensure minimal electrode positional movement and better skin–electrode contact, all electrodes and their connections were secured with adhesive tape. The myoelectric measurements were guided by the reference of Soderberg (1992).

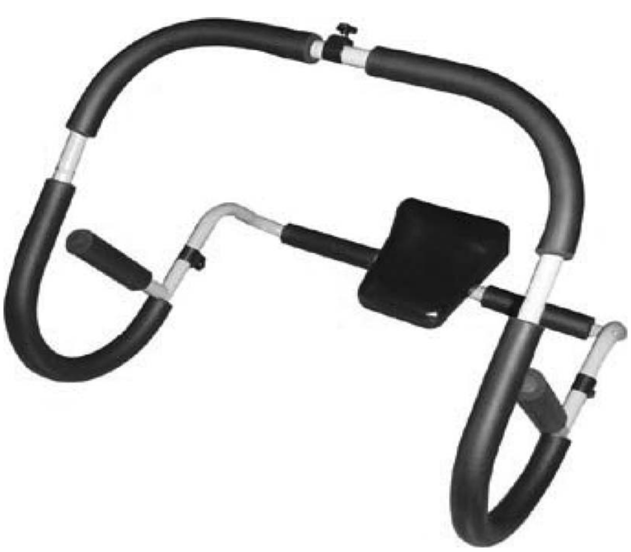

Fig. 1 The commercial abdominal exercise apparatus used in this study.

During the actual testing session, each participant was instructed to perform the four forms of abdominal exercise (AbRoller-performed versus traditionally performed abdominal exercises; ankles stabilized versus unstabilized) with the sequence of the testing order being randomized using a Latin-square design. Each participant performed four repetitions on each form of abdominal exercise. An interval of 2 minutes of rest was provided between consecutive four-repetition abdominal exercises to prevent performance decrements due to potential muscular fatigue. All abdominal exercises were performed with knees bent at a 90 deg angular displacement measured by a double-armed goniometer (Preston, Lafayette Ins., Lafayette, IN, USA). A metronome (Model DM-20; Country Technology, Gays Mills, WI, USA) was used to ensure a uniform angular velocity during the execution of each repetition of the abdominal exercise testing. The metronome was set at 60 bpm so that each repetition was performed in the following 3-second sequential cycle: (a) a 1-second concentric upward phase, (b) a 1-second isometric hold, and (c) a 1-second eccentric downward phase. Afterwards, a 2-second rest interval was followed to facilitate an immediate muscular recovery and regain of mental concentration before the next cycle was initiated. Furthermore, the trunk curl angular displacement was monitored by an inclinometer (Baseline, Fabrication Ent., Irvington, NY, USA) in which the trunk was not allowed to curl beyond a 45 deg angle in all abdominal exercise testing. A test administrator monitored and instructed the participants to stop the continual trunk curl when the initial 45 deg angle was completed during the 1-second concentric upward phase. In addition, a 1.5-cm exercise mat was provided during the executions of all forms of abdominal exercises.

Data acquisition and statistical analysis

The raw myoelectric data acquired and recorded at a rate of 1000 Hz using a multichannel myoelectrical recording system (Model 544; Therapeutics Unlimited, Iowa City, IA, USA) were amplified, filtered, rectified, and smoothed. The peak and mean myoelectric data were collected from all forms of abdominal exercise testing. From the acquired myoelectric data, only the second and third repetitions were utilized and averaged for analysis. To examine if there were any differences in the peak and mean myoelectric data for each muscle, repeated measures two-way ANOVA (mode × ankle) analyses were conducted. To determine significance, an alpha level of $p < 0.05$ was utilized. *Post hoc* examinations of significant ANOVA were followed by paired t tests to determine the differences between exercise modes using the AbRoller and the traditional crunches, and between exercise forms with ankles stabilized versus ankles unstabilized.

Results

With respect to the rectus abdominis muscle, no significant differences ($p > 0.05$) were found in the relative peak and mean myoelectric activities between the AbRoller-performed and the traditionally-performed abdominal exercises for both exercise forms (ankles stabilized versus unstabilized). For the rectus femoris muscle, no significant differences ($p > 0.05$) in the relative peak and mean myoelectric activities were observed between abdominal exercises as performed using the AbRoller and the traditional crunch. Regarding the two forms of abdominal exercises, the myoelectric activities varied across muscles and were independent of exercise mode (AbRoller versus traditional crunch). With respect to the rectus femoris muscle, significantly higher peak (48.5%, $p < 0.01$) and mean (44.8%, $p < 0.01$) myoelectric activities were evident when the abdominal exercises were performed with ankles stabilized versus unstabilized. No significant differences ($p > 0.05$) were found in the relative peak and mean myoelectric activities between the two forms of abdominal exercises for the sternocleidomastoid, sacrospinalis, and rectus abdominis muscles.

With regard to the sacrospinalis muscle, no significant differences ($p > 0.05$) in the relative peak and mean myoelectric activities were observed between abdominal exercises as performed using the AbRoller and the traditional crunch. With respect to the sternocleidomastoid muscle, the AbRoller exercise resulted in significantly lower ($p < 0.05$) relative peak and mean myoelectric activities than the traditional abdominal exercise in both exercise forms. With ankles stabilized, the use of the AbRoller resulted in 29.8% ($p < 0.01$) lower peak myoelectric activity and 31.6% ($p < 0.01$) lower mean myoelectric activity relative to the traditional crunch. Similarly, when abdominal exercises were performed without ankles stabilized, the peak and mean myoelectric activities measured during the AbRoller-performed exercise were 32.3% ($p < 0.01$) and 30.8% ($p < 0.01$), respectively, lower than for the traditional abdominal exercise.

Comparisons of the relative peak and mean myoelectric activities of the AbRoller exercise relative to the traditional crunch between the two exercise forms of ankles stabilized versus unstabilized for rectus abdominis, rectus

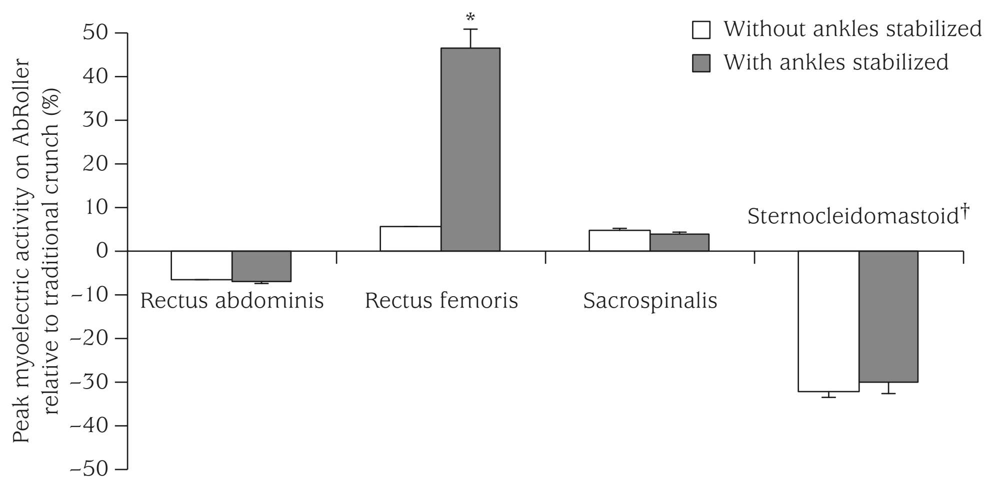

Fig. 2 Comparisons of the peak myoelectric activity (%) of AbRoller-performed exercise relative to traditionally-performed abdominal exercise (100% activation) between two exercise forms with ankles stabilized versus unstabilized for the following muscles: rectus abdominis, rectus femoris, sacrospinalis, and sternocleidomastoid. *Significant difference ($p < 0.05$) between exercises with ankles stabilized versus ankles unstabilized; †significant difference ($p < 0.05$) between the AbRoller and traditional abdominal exercise.

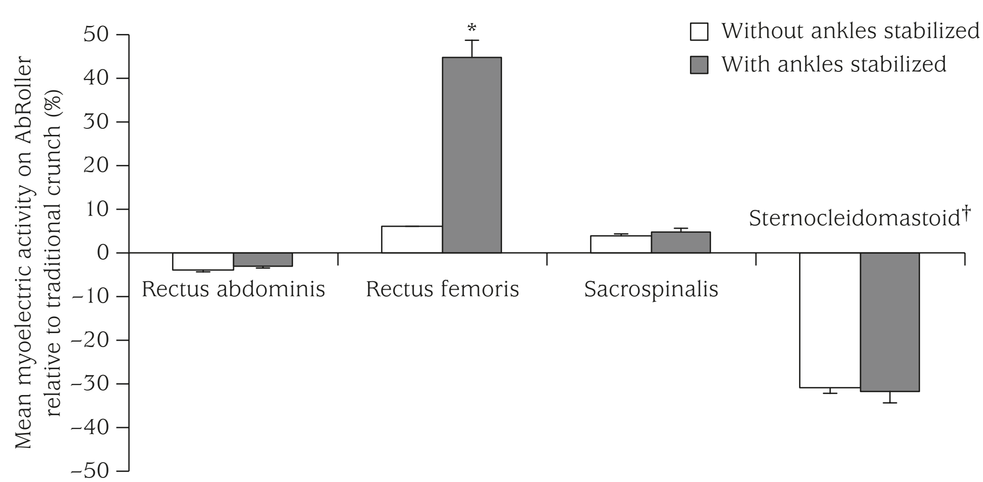

Fig. 3 Comparisons of the mean myoelectric activity (%) of AbRoller exercise relative to traditional abdominal exercise (100% activation) between two exercise forms with ankles stabilized versus unstabilized for the following muscles: rectus abdominis, rectus femoris, sacrospinalis, and sternocleidomastoid. *Significant difference ($p < 0.05$) between exercises with ankles stabilized versus ankles unstabilized; †significant difference ($p < 0.05$) between the AbRoller and traditional abdominal exercise.

femoris, sacrospinalis, and sternocleidomastoid are presented in Figures 2 and 3, respectively. Because the study was designed to evaluate the effectiveness and safety of the AbRoller compared to the traditional crunch, the myoelectric measurement on the AbRoller was expressed relative to that measured on the traditional abdominal exercise. The myoelectric data measured on the traditional crunch was utilized as the representation of 100% muscle activation. Specifically, the averaged relative peak and mean myoelectric activities measured on the AbRoller were calculated as the respective percentages of those of the corresponding traditional abdominal exercise.

Discussion

The prime objective of the present independent scientific trial was to evaluate whether a selected abdominal exercise machine, the AbRoller, was effective and safe.

Results revealed that the AbRoller-performed abdominal exercise elicited similar abdominal muscle and hip flexor muscle recruitments as compared with the traditionally performed abdominal exercise, thus reflecting that the use of the AbRoller was relatively effective and safe. The effectiveness of performing abdominal exercise is indicated by the muscular activity of the abdominals while the safety of abdominal exercise is reflected by the muscular activity of the hip flexors. Anatomically, the abdominals consist of four major muscles (Guyton & Hall 2006; Moore & Agur 2006). From most superior to most inferior, the abdominal muscles are the rectus abdominis, the external obliques, the internal obliques, and the transversus abdominis. The hip flexor muscle group is composed of the rectus femoris and the iliopsoas (Guyton & Hall 2006; Moore & Agur 2006). In the present study, the rectus abdominis was selected to represent the abdominal muscle group and the rectus femoris was chosen to represent the hip flexor muscle group.

The underlying principle of performing abdominal exercise is to effectively and safely condition the abdominal muscle group but not to recruit the hip flexor muscle group. However, during the execution of abdominal exercise, both muscle groups could also be recruited. Therefore, the goal of abdominal exercise is to increase the abdominal muscle involvement but decrease the participation of the hip flexors (Hall et al. 1990; Alexander 1985; Gilliam & Roy 1980; Vincent & Britten 1980; Nachemson 1976; Girardin 1973). When the abdominal muscles contract, they pull the pelvis into a posterior tilt position which causes the back to flatten. The contraction of the hip flexor group has the opposite effect which increases anterior pelvic tilt by hyperextending the lower back. If the abdominal muscles are not strong enough to counteract the force generated by the hip flexors, there is an increased risk of developing lumbar lordosis. Anterior pelvic tilt is undesirable during the execution of abdominal exercise as the hyperextension of the back and compression on the intervertebral discs is increased markedly as is the stress applied to the posterior vertebral structures such as ligaments, neural arch, and facet joints (Hall et al. 1990; Alexander 1985; Gilliam & Roy 1980; Vincent & Britten 1980; Nachemson 1976; Girardin 1973).

Results of the present study clearly indicated that the undesirable hip flexor involvement increased when abdominal exercises were performed with ankles stabilized. Hence, physical educators and fitness professionals should emphasize to students and clients that abdominal exercises should be performed without the stabilization of the ankles. Data from the present study showed that substantial higher rectus femoris myoelectric activities were evident (48.5% higher in peak myoelectric activities and 44.8% higher in mean myoelectric activities) when abdominal exercises were performed with ankles stabilized than when performed in an unstabilized position. Hence, performing abdominal exercise with ankles stabilized is not suggested because the undesirable rectus femoris muscle is activated and the participation of the hip flexor would potentially lead to back pain. Similar results from previous literature (Juker et al. 1998; Axler & McGill 1997; Sparling et al. 1997; Diener et al. 1995; Alaranta et al. 1994; Hall et al. 1992; Faulkner et al. 1989; Robertson & Magnusdottir 1987) that are consistent with the current findings is evident.

An early study was conducted by Walters and Partridge (1957) in which two female participants were instructed to perform different variations of abdominal exercises. Myoelectric activities were recorded at the abdominal muscles (rectus abdominis, internal obliques, and external obliques) and hip flexor (rectus femoris). The researchers indicated that the relative hip flexor involvement was greater when the ankles were stabilized than unstabilized in both sit-ups and curl-ups. Moreover, the relative abdominal muscle involvement was greater in the bent-knee position than in the straight-leg position in both types of abdominal exercises. Furthermore, the relative participation of the hip flexor was higher when the knees were flexed at 65 deg whereas the relative participation of abdominal muscles was higher at a 90 deg knee angle. Walters and Partridge (1957) concluded that abdominal exercises with ankles stabilized increased the participation of the hip flexor.

Gutin and Lipetz (1971) investigated the myoelectric activity of the rectus abdominis in eight male high school athletes during sit-ups with the variations of straight-leg versus bent-knee position, ankles stabilized versus unstabilized, and arms placed behind head versus across chest. The researchers reported that the bent-knee, ankles unstabilized, and chest-fold sit-up produced greater myoelectric activity in the rectus abdominis.

They suggested that the bent-knee sit-up was a strenuous movement for the abdominal muscles which might isolate the abdominals and thereby minimize the potential for the hip flexors to assist the movement (Gutin & Lipetz 1971). Vincent and Britten (1980) claimed that with the hips in a flexed position, the pull of the psoas was minimized and the lower back was less likely to hyperextend. Girardin (1973) examined the myoelectric activity of the rectus abdominis during the execution of the traditional sit-up and bench sit-up. Sixteen male volunteers were instructed to perform the sit-ups in the bent-knee position with ankles stabilized and with both hands placed behind the neck. Girardin (1973) indicated that the myoelectric activity was greater in the upward phase than in the downward phase for both sit-up forms. Secondly, stronger myoelectric activity of the rectus abdominis was elicited when performing the bench sit-up than when the traditional sit-up was performed. The researcher speculated that performing the bench sit-up might enhance abdominal muscle involvement and decrease the participation of the hip flexors (Girardin 1973). However, this hypothesis could not be verified since no myoelectric measurements have been obtained at the hip flexors in this study.

Ricci et al. (1981) compared the myoelectric activity of seven muscle sites during the straight-leg sit-up, the bent-knee sit-up, and the curl-up in four males. Other than the typical sites for myoelectric measurements such as rectus abdominis, external obliques, and rectus femoris, four other sites in the thigh and hamstring muscle groups as well as calf group and foot dorsiflexors such as vastus medialis, vastus lateralis, tibialis anterior, and gastrocnemius were also obtained. These researchers reported that the thigh and hamstring muscle groups as well as the calf and foot dorsiflexors were involved in all forms of exercises. Secondly, in all abdominal exercises, the myoelectric responses for the abdominal muscles were similar to those reported by Girardin (1973) where greater myoelectric response was elicited during the trunk flexion phase than during the trunk extension phase. Thirdly, the curl-up stressed the abdominal muscles mostly during the trunk flexion phase between approximately 10 deg and 50 deg. Trunk flexion beyond this range was the primary responsibility of the hip flexors and thigh muscle group. Ricci et al. (1981) concluded that the curl-up should be recommended to be an exercise that stressed the muscles of the abdominals and the lower limb.

For the myoelectric studies reviewed previously, surface/skin electrodes were employed to measure the myoelectric activity of rectus abdominis, external obliques, and rectus femoris. However, the myoelectric activity of the iliopsoas, a hip flexor, was of interest but was largely unknown due mainly to the inaccessibility of this muscle group for surface myoelectric recordings. Andersson et al. (1995) applied indwelling/needle electrodes to the psoas and iliacus muscles to measure their myoelectric activity in seven participants (four males and three females) during the following four variations of abdominal exercises: (a) straight-leg sit-up with ankles stabilized; (b) bench sit-up with ankles stabilized; (c) bench sit-up with ankles unstabilized; and (d) curl-up with ankles unstabilized. The researchers found that the psoas and iliacus muscle involvements for the straight-leg sit-up with ankles stabilized was strong. They revealed that the iliopsoas involvement was stronger when the bench sit-up with ankles stabilized was performed. Another crucial finding was that no iliacus involvement was observed when the bench sit-up with ankles unstabilized was performed but the psoas was found to be involved at the most flexed position. Lastly, no psoas and iliacus involvement was observed in performing the curl-up. Andersson et al. (1995) concluded that performing the sit-up and bench sit-up involved the hip flexor participation if the ankles were stabilized and further suggested that hip flexor activity could be excluded by performing the curl-up.

To generalize briefly, in agreement with the findings of the current study, performing abdominal exercise with ankles stabilized is no longer recommended due to the undesirable involvement of the hip flexors. Apart from the factor of ankle stabilization, previous studies suggested that other variables such as the knee-bent and trunk-curl angles were important considerations for how to perform abdominal exercises safely and properly. In short, an effective and safe abdominal exercise should be performed in a bent-knee ankle-unstabilized position with a trunk curl angle not beyond the initial 45 deg so as to maximize the contribution of the abdominal muscles and minimize the participation of the hip flexors during the entire range of motion (Macfarlane 1993; Norris 1993; Piering et al. 1993; Hall et al. 1992;

Hall et al. 1990; Robertson 1987; Jette et al. 1984; Griffin 1983; Mutoh et al. 1983; Kelley 1982; Halpern & Bleck 1979; Godfrey et al. 1977; Lipetz & Gutin 1970).

Besides, the AbRoller-performed abdominal exercise generated lower neck muscle recruitment and similar back muscle involvement as compared with the traditionally performed abdominal exercise. The findings appear to be intuitively logical. With respect to the neck muscle activity, abdominal exercises performed using the AbRoller produced less sternocleidomastoid muscle activation than that performed traditionally. The lower neck muscle involvement during the AbRoller-performed exercise should probably be attributed to its neck pad that provided improved support for the neck. With regard to back muscle activity, abdominal exercises performed on the AbRoller generated similar sacrospinalis muscle activation as that with the traditional crunch. As a mat was provided during all testing, the back muscle antagonistic to the anterior abdominal muscle was logically anticipated to produce similar tensions between the AbRoller and traditional abdominal exercises.

In summary, major findings of the present study revealed that abdominal exercises performed while using the AbRoller elicited similar abdominal muscle and hip flexor involvement as compared with the traditional crunch. With ankles stabilized, hip flexor involvement increased remarkably in all forms of abdominal exercises. Besides, the AbRoller exercise generated lower neck muscle recruitment and similar back muscle participation as compared with the traditional crunch. To conclude, data reflect that the use of the AbRoller appears to be effective in recruiting abdominal muscles and also safe in reducing the undesirable hip flexor activities provided that ankles are not anchored and stabilized. More importantly, the Federal Trade Commission offers consumer tips and provides consumer publications about abdominal exercise equipment (Federal Trade Commission 2003a,b, 2002). To summarize, the Federal Trade Commission advises consumers to consider the following points before purchasing such equipment. Consumers should ignore the false claims that an abdominal exercise machine can provide long-lasting, easy, and "no-sweat" results in a short time. Consumers should not be misled that a machine can burn fat off your stomach, hips, or buttocks. Consumers should read the advertisements' fine print carefully. Consumers are advised to be skeptical of testimonials and before-and-after pictures from the so-called "satisfied" customers. Consumers should get details on warranties, return policies, and the company's customer and support services (Federal Trade Commission 2003a,b, 2002). Last but not least, the bottomline from the fundamental exercise physiology concept is that you cannot burn fat away from the hip/abdominal region unless you expend excessive energies by exercising. From a holistic standpoint and approach, achieving your desirable appearance requires sensible diet plans and regular whole-body aerobic exercise. On top of that, a properly executed abdominal exercise even without using a machine is adequate to facilitate the conditioning of muscular endurance for the abdominal musculature.

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