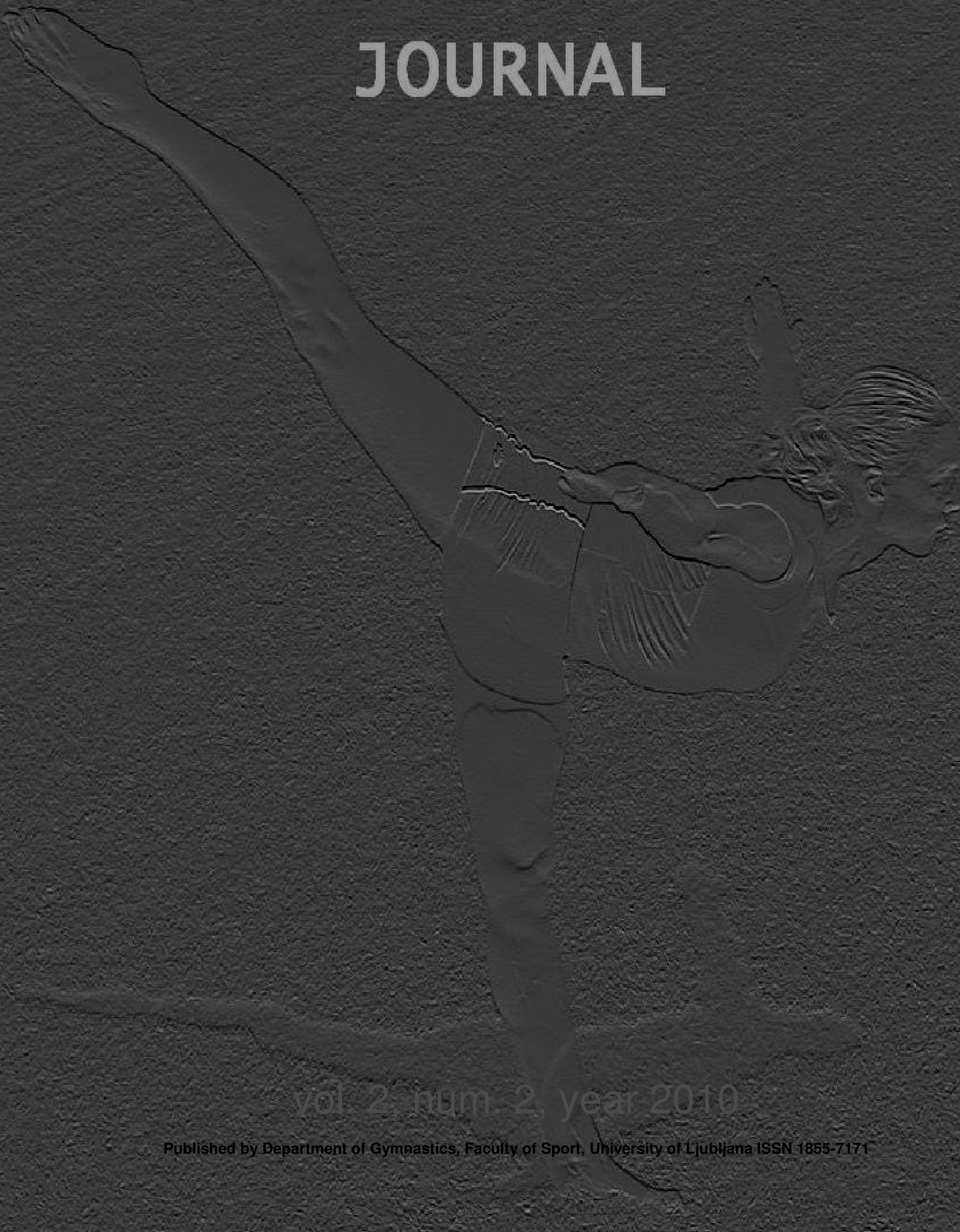
SCIENCE OF GYMNASTICS JOURNAL



vol. 2, num. 2, year 2010

Published by Department of Gymnastics, Faculty of Sport, University of Ljubljana ISSN 1855-7171

Science of Gymnastics Journal (ScGYM®)

Science of Gymnastics Journal (ScGYM®) is an international journal that provide a wide range of scientific information specific to gymnastics. The journal is publishing both empirical and theoretical contributions related to gymnastics from the natural, social and human sciences. It is aimed at enhancing gymnastics knowledge (theoretical and practical) based on research and scientific methodology. We welcome articles concerned with performance analysis, judges' analysis, biomechanical analysis of gymnastics elements, medical analysis in gymnastics, pedagogical analysis related to gymnastics, biographies of important gymnastics personalities and other historical analysis, social aspects of gymnastics, motor learning and motor control in gymnastics, methodology of learning gymnastics elements, etc. Manuscripts based on quality research and comprehensive research reviews will also be considered for publication. The journal welcomes papers from all types of research paradigms.

Science of Gymnastics Journal is indexed in
EBSCOhost SPORTDiscus (USA),COBISS (IZUM) Slovenia), SIRC (Canada).
ScGYM® (ISSN 1855-7171) is an international online journal published three times a year (February, June, October).

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Science of Gymnastics Journal is supported by Foundation for financing sport organisations in Slovenia and Slovenian Book Agency.

Fundacija za šport

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EDITORIAL

Dear friends,

It is already four months since the last issue of the Science of Gymnastics Journal. In the period from 1 February to 1 June, the previous issue received 4320 visits from 81 countries. For a scientific journal, this is quite a respectable number.

In May/June, EBSCOhost list of Journals included the Science of Gymnastics Journal in the SPORTDiscus database. Hence, our Journal is now indexed in the largest sport journal databases.

Additionally, Thomson Reuter promised to consider evaluating our Journal for the Impact Factor if we publish our next three issues on time (June and October 2010 and February 2011). As you have been very diligent sending your papers we are certain we can respond to the Thomson Reuter's requests in good time and with high quality content.

The gymnastics community (FIG) knows that more knowledge leads to a lift in the level of gymnastics. At the end of June, the second symposium on artistic and rhythmic gymnastics, organized by the Faculty of Physical Education, Campinas University, will be held in Sao Paolo, Brazil. You can visit their web site at http://www.fef.unicamp.br/sigarc2010/index.htm. We strongly support gymnastics conferences and would like to share information about all such scientifically orientated events. If you are planning to organize a scientific conference on gymnastics please let us know and we will publish the information on our pages.

In the current issue, we present a History of the USA Artistic Gymnastics written by Abie Grossfield. I first met Abie in 1995 when he was video recording the World Championships in Sabae. Abie is a living legend and in his article I found interesting new pieces of information that only somebody who has lived the moment can provide. His article is the first historical article in our Journal and hopefully it will inspire others (for example, Antonin Gajdoš who will turn 70 this year) to write more such papers.

Mikko Pehkonen from Finland conducted an interesting research study on the quality of teaching in schools. The physical education theme is another new topic in this Journal and, again, it will hopefully lead to many more stimulating papers on gymnastics in schools.

Our third article comes from the United States; it was written by Earhart Gammon who researched and analyzed walking in handstand in comparison with normal walking.

The next article is from Greece: George Dallas examined judges in men's artistic gymnastics and how their knowledge and experience influence the quality of judging.

The last article is from Slovenia. Miha Marinšek writes about landings in gymnastics. His review provides an overview of what has been done and suggestions on what should be done in the near future about landings.

Wishing you inspiring reading,

Ivan Čuk
Editor-in-Chief

A HISTORY OF UNITED STATES ARTISTIC GYMNASTICS

Abie Grossfeld

Southern Connecticut State University , New Haven, USA

Invited original research article

Abstract

"A History of United States Gymnastics," by Abie Grossfeld, covers the development and accomplishments of U.S. gymnastics through the years, starting with the organizations and the individual pioneers who introduced and helped spread gymnastics across the U.S. The contributions, to U.S. gymnastics, of the various organizations – Turnvereins, Sokols, YMCAs, athletic clubs, colleges, and high schools - are explained. In addition are the roles that the NCAA and AAU had in U.S. gymnastics development. Presented are the nature of and the participation in the various past and present gymnastics events (apparatus). Listed are skills that were initially performed by U.S. gymnasts for each event, and the notable accomplishments of U.S. gymnastics luminaries. How American gymnasts fared in international competition, with special performances, through the years, starting with the 1904 Olympic Games up to the 2009 World Championships. Lists for U.S. gymnastics medal winners are provided for the U.S. Olympic Games, World Gymnastics Championships, World University Games and Pan American Games.

Keywords: *artistic gymnastics, USA, history.*

AMERICAN GYMNASTICS PIONEERS

The history of gymnastics in the United States started with three followers of Friederich Ludwig Jahn, known as the father of German gymnastics. The three disciples that are credited with introducing gymnastics to the United States are Carl "Charles" Beck, Carl "Charles" Follen, who came to the U.S. from Germany in 1824, and Francis Lieber who arrived in 1827. Beck first developed Jahn's gymnastics system at the Round Hill School in Northampton, Massachusetts, where he spent five years. Beck had Jahn's book, "Deutsche Turnkunst" (German Artistic Gymnastics) translated into English. Then Follen, who was also a teacher at Round Hill School, became a member of Harvard University's faculty in 1831, where he introduced Jahn's system of physical training. Beck was also active at Harvard University from 1832 to 1850. In 1826, Yale University in New Haven, Connecticut purchased gymnastics apparatus to be placed on the college campus. Simultaneously, brothers named Devight opened the New Haven Gymnasium where gymnastics exercises were practiced. In Amherst, Massachusetts, the Turnplatz (based on Jahn's model) opened in 1828. Other schools and clubs soon followed Beck's and Follen's example (Metzner, 1989).

AMERICAN TURNVEREINS

About 20 years after Follen, Beck and Lieber had developed their programs, the Turnverein or Turngemeinde (gymnastics societies) movement in America took hold. Through the efforts of German immigrant Fredrick Hecker, the first Turnverein opened in Cincinnati in 1848. (U.S. President Howard Taft was a member of the Cincinnati Turnverein) (Old caricature drawing in the archives of the New York Turnverein now at International Gymnastics Camp, Stroudsburg, PA). The American Turnvereins were completely independent and did not have ties to the Turnvereins in Germany (Metzner, 1989). Then, Turner halls opened up in Boston and Philadelphia in 1849, in New York, St. Louis and other cities in 1850. By 1885, 89 cities had Turner clubs (Moore, 1941) and kept expanding so that by 1894, there were 317 Turner clubs with 40,000 members (Wright, 2005). Eventually, over 700 Turner clubs existed across the U.S. (Wright, 2005). Of the various nationality Turnvereins, German, as one would surmise, were the most common, followed by Swiss. New York City alone had several Turnverein clubs located in the boroughs of Manhattan, Brooklyn (which also had a Norwegian Turners), Queens, and the Bronx. Located just across the Hudson River from New York's Manhattan, in New Jersey were other Turnvereins, including the National (in Newark), the Elisabeth, Union Hill and the Swiss Turners of Hudson County in the Union City, where at least 15 U.S. Olympic men and women gymnasts had trained - Alfred Jochim (1924, '28,'32, '36), Herman Witzig (1928, '32), Frank Haubold (1928, '32, '36), Frank Cumiskey (1932, '36, '48), Marcel Gleyre (1932), Arthur Pitt (1936), Irma Haubold (1936), Ada Lunardoni (1936), Helen Schifano (1948), Vincent D'Autorio (1948, '52), Dorothy Dalton (1948, '52), Doris Kirkman (1952), Donald "Don" Holder (1952), Fred Orlofsky (1960), and Greg Weiss (1964). Also, William "Bill" Taylor, a three times National pommel horse champion (1934, '35 and '41) and Robert Sears, a National parallel bars and vaulting champion (1947) – had represented the Swiss Turners. Up until the 1952 Olympics, most of the U.S. women Olympians and National Champions came from the Philadelphia Turners (Maloney, 1953). Some of the top women (and men) gymnasts also came from other Turners clubs in different areas of the country - like Chicago, Los Angeles, Baltimore, Buffalo, Omaha, Milwaukee and Madison (Wisconsin), New York and Newark,. Over the years and up until just a few years ago, the number of American Turnvereins have dwindled so that approximately 60 Turner clubs, divided into 14 districts, with a total of 13,000 members were left (Wright, 2005).

AMERICAN SOKOLS

The Sokol clubs were the Slavic version of the Germanic Turnvereins. The first Sokol in America was established in Saint Louis in 1865, just three years after Miroslav Tyrs founded the organization in Bohemia (Wikipedia, 2010). Soon Bohemian, Slovakian, Slovenian and Polish Sokols spread across the U.S. However, the Polish called themselves Falcons, which is the English translation for Sokols. Early prominent U.S. National champions and Olympians who came from the Sokols were: Frank Jirasek, Anton Jahoda, Anton Klar, Rudolph Hradecky, Frank Kriz, and Ladislava "Laddie" Bakanic, a (1948) woman Olympian. The U.S. Postal Department issued a stamp in 1965 to commemorate 100 years of Sokols in the U.S. (Wright, 2005).

COLLEGE (UNIVERSITY), HIGH SCHOOL AND YMCA GYMNASTICS

After Beck and Follen, Dr. Dudley Sargent contributed apparatus training at Harvard University in 1879. Yale University soon followed suit and had gymnastics competitions (Moore, 1941; Wright, 2005). At least half of the "gymnastics" competitive events in the late 1800s and early 1900s were track and field events, which currently are retained in the American Turner and Sokol competitions. (Track and field events were part of the gymnastics all-around program in the early Olympic Games and up until the 1950 World Gymnastics Championships.)

Several universities, other than Harvard and Yale, initiated gymnastics programs in the late 1800s and early 1900s. The first Intercollegiate Gymnastics Championships was held at the University of Chicago (Illinois) in 1897, followed by an eastern competition at New York University in 1899. Then the Intercollegiate Association of Amateur Gymnasts of America was formed in 1900 (Moore, 1941).

Collegiate competitive programs were initiated: at Oklahoma in 1902, at Minnesota in 1903, at Illinois in 1909, at California in 1912, and at Iowa in 1917. Illinois and Minnesota had remnants of gymnastics activities as early as 1889 and 1898 respectively. In 1927, the U.S. Military Academy met McGill University (Montreal) in what may have been the first U.S. intercollegiate international competition (Gymnastics Media Guides; A History of Gymnastics at the University of Minnesota, 1898-1950).

Early regional collegiate conference championships still being conducted today are the Big Ten in the mid-west (formerly called the Western Conference which was initiated as early as 1903), and the Eastern Intercollegiate Gymnastics League (EIGL, initiated in 1926) now being conducted as the Eastern Collegiate Athletic Conference (or ECAC - in the northeast) (Wright, 2005; Gymnastics Media Guides; Frederick, 2009).

The first institution that provided a formal gymnastics education was the Normal College of the American Gymnastics Union (a Turner related organization) - founded in 1866. It was initially a traveling institution, first settling in New York City, then moving to Chicago before moving to Milwaukee in 1875, under the leadership of George Brosius, and eventually it settled permanently in Indianapolis in 1907. The Normal College eventually became an extension of Indiana University (Wright, 2005; personal accounts).

Starting in 1868, the YMCAs established gymnasiums which were equipped with apparatus that helped spread gymnastics, however, it was difficult to find competent teachers. To meet this need, Springfield College in Massachusetts opened a physical training department in 1887 and developed the needed physical education instructors for the YMCAs. Through the years, U. S. National champions and Olympians were developed through the YMCA programs, with the earliest National champions representing a YMCA being in 1886 (Moore, 1941).

Leopold F. Zwarg, who had immigrated to the U.S. around 1910, taught at the Philadelphia Turners before teaching in the Philadelphia public high school system. Dr. Zwarg organized the first public high school gymnastics league in the U.S. (in Philadelphia) in 1923. He had written a number of books including: "A Study of the History, Uses, and Values of Apparatus in Physical Education," "Apparatus Work for Boys and Girls," and "Apparatus and Tumbling Exercises" (Moore, 1941; Wright, 2005).

California organized one of the early official high school championships and had the overall strongest high school gymnastics program in the U.S. during the 1940s and the 1950s. Eventually, high schools in just about every state developed gymnastics programs. Illinois, Texas, Pennsylvania, Minnesota, Ohio, Indiana, Florida, New Jersey and, New York were some of the states that had especially strong high school programs. While there were many states that had hundreds of boys' high school programs in the 1970s, as of 2010 boys' high school teams no longer exist in many states, with just a smattering of a few programs in several states. Girls' high school gymnastics was initiated years after the boys' and as of 2010, still have many (high school) programs across the USA (personal accounts).

Starting in the 1950s, most of the U.S. international men gymnasts had gone through the high school and college programs which had the resources of operating budgets, well equipped gymnasiums, salaried professional coaches and therapists.

The major collegiate gymnastics competition in the U.S. is the National Collegiate Athletic Association (NCAA) Championships, which was initiated in 1938. In its peaks years, the 1960s, there were approximately 140 collegiate men's gymnastics teams. The number has continually fallen off so that as of 2010, there are only 17 collegiate men's varsity (eligible under NCAA jurisdiction to compete in official college-university championships and are financially supported by the colleges) gymnastics teams across the U.S. The collegiate women's gymnastics competition did not take hold until the late 1950s. The Association for Intercollegiate Athletic for Women (AIAW) became the first official national collegiate women's sports organization in the 1960s and was dissolved after the NCAA became the governing authority with their first women's gymnastics championships in 1982. Well over 100 college varsity women's gymnastics teams have dwindled so that as of 2010, there are 91 women's varsity college teams in the USA (12). However, there are number of men's and women's collegiate gymnastics non-varsity clubs (which are not fully supported financially by the college and not eligible for the NCAA Championships) across the country.

AMATEUR ATHLETIC UNION

The earliest administrative organization that regulated and governed gymnastics (and other sports) competitions, which brought the various U.S. organizations with gymnastics into a common open competition each year was the Amateur Athletic Union (AAU). The AAU held its first National Gymnastics Championships (NAAU) in 1885, with parallel bars, horizontal bar, rings and Indian clubs; tumbling was added in 1886; rope climb in 1888; the all-around, side (pommel) horse and long horse (vaulting) in 1897; and free calisthenics (floor exercise) had its first national championships in 1921. A team competition was added in 1914. The Swiss Turners of Hudson County, New Jersey for men and the Philadelphia Turners for women, won the most team titles over the years. Up until 1915, three optional exercises for each competitor on each apparatus were required, then it was reduced to two exercises. The international program, which allowed for just one compulsory and one optional exercise, was adopted in the U.S. after its gymnasts started entering international competition. Women first competed in the National AAU Championships in 1931 (Moore, 1941).

The AAU published an annual gymnastics handbook (1941 to 1966) (Moore, 1941; Maloney, 1953) featuring various articles, results of national and regional AAU, Turner, Sokol, college, and YMCA competitions across the country. Also, the AAU rules for competition, apparatus specifications, the national senior compulsory exercises, along with junior and novice level compulsories, were featured. As early as 1940, the AAU had committees in 41 district associations across the U.S. who organized competitions for senior, junior and novice level gymnasts in their region with each level's required compulsory and optional exercises (Moore, 1941).

From the first National Championships in 1885 and up until 1970, the AAU was the premier or elite U.S. National championships. It continued to be conducted after 1970 but was no longer the premier National championships (*see later comments). Two-thousand ten (2010) marks the 125 year that theU.S. National gymnastics championships have been conducted (personal accounts).

CONTRIBUTIONS OF THE TURNERS, SOKOLS, PRIVATE CLUBS, ATHLETIC CLUBS AND COLLEGES (UNIVERSITIES)

In recent times, most of the Turner and Sokol halls have been closed down but, until fairly recently, gymnasts of stature have still been produced through these organizations. For example, Jim Hartung (1980, 1984 Olympian) and Phil Cahoy (1980 Olympian) came through the Sokol Club in Omaha, Nebraska, and Paul and Morgan Hamm (2000, 2004 Olympians) came through the Swiss Turners in West Allis, Wisconsin.

The first privately owned gymnastics clubs in the U.S. started in the early 1950s. And, today there are literally many hundreds of clubs scattered in every part of the United States. Over the years, the best American girls-women gymnasts, who were usually pre-college age, have come from private gymnastics clubs. After their elite or international gymnastics careers, many women go on and compete (if they maintain their amateur status, having not received any money related to gymnastics performance and are eligible under NCAA rules) for the colleges that they attend. Since the women's college gymnastics difficulty requirements for competition have been much less stringent than the international (FIG) requirements, it became easier for international women gymnasts to be successful during their college gymnastics career.

In recent times while most of the U.S. elite men gymnasts have gotten their initial start at private clubs, they go on to college and continue their training and from there, go on and tryout for the various international teams. Therefore, unlike the women, the men use the FIG Code of Points (rules) in their college competition. Yes, some U.S. men gymnasts have come from private clubs directly onto the U.S. international teams (personal accounts). Also, athletic club programs have provided a good number of National Champions, starting with the first National AAU Championships in 1885 (Moore, 1941).

USA GYMNASTICS (USAG, FORMERLY USGF)

Starting in the late 1950s, some college coaches rebelled against the AAU gymnastics officials, who had full control of the coach selection and other aspects of the U.S. international program. The college coaches began to organize the United States Gymnastics Federation (USGF, later USAG). The USGF initiated their national championships in 1963. Since the AAU was the national governing body, gymnasts could only qualify for the U.S. Olympic, World Championship, and Pan American teams though the National AAU championships and trials. Most of the best U.S. gymnasts, men and women, did not take part in the USGF championships until 1970, when the USGF replaced the AAU as the national governing body. It was a good move in that the USGF's only concern was gymnastics. The AAU was an "umbrella" organization, governing a number of sports like fencing, boxing, wrestling, and some others, with its primary focus on track and field and swimming (personal accounts).

Events that were part of the earlier U.S. gymnastics competitions that are now contested separately

Trampoline was developed in the United States, with the first recorded competition occurring in Dallas, Texas in 1946 and was won by American Skippy Browning (who went on and became the 1952 Olympic Springboard Diving Champion) (Copp). The first international trampoline competition was in the 1955 Pan American Games and was won by American Don Harper (who the following year won the silver medal in springboard diving at the 1956 Olympic Games). Trampoline was also contested as part of the gymnastics competition at the 1959 Pan American Games and was won by American Ron Munn, who performed a triple front salto (somersault), the first known triple salto in competition (personal accounts). American Dan Millman was the first world trampoline champion. In the early 1970s, trampoline competitions were separated from the gymnastics competitions (personal accounts).

Tumbling - Note: all the following tumbling skills mentioned were performed (without springs) on hair mats or on grass. American Rowland Wolfe, who placed 1st in tumbling at the 1932 Olympic Games, performed a back salto with a double twist (2/1) as part of his routine (Viewed on movie films ot youtube). Tumbling was contested in the gymnastics competition in both the 1955 and 1959 Pan American Games. Americans William "Bill" Roy won in 1955, and Harold "Hal" Holmes won in 1959, where Holmes performed a roundoff, flip flop (flic flac), back salto with a full twist (1/1), flip flop, back double salto - as one of his four tumbling passes. Holmes was a four time National tumbling champion. He also successfully performed a back double salto with a full twist ((Tsukahara) in 1962 (personal accounts; private DVD of Hal Holmes' tumbling career). In 1942 American Harold Zimmerman successfully performed a back salto with a triple twist (3/1) in the National AAU tumbling championships (14). In the 1953 National AAU Championships (in Chicago), Richard "Dick" Browning performed the following first tumbling pass – roundoff flip flop, back salto ½ twist, front handspring, front salto step out, roundoff flip flop, back double salto (11, 30). Browning was a four time National AAU tumbling Champion in his career. He was also famous for performing a back salto (off grass and a hair mat – without springs) over a high jump cross bar at 7 feet 5 inches in 1953 (personal accounts; viewed on movie films or youtube) (three years before the first track and field high jumper cleared 7 feet). (Dick's brother was Skippy Browning, the 1952 Olympic springboard diving champion.) In 1951, James "Corky" Sebbo performed the following pass in tumbling competition: roundoff, flip flop, back salto with 2½ (5/2) twist step out, roundoff flip flop, back salto with double twist (2/1) (personal accounts). Sebbo was a two-time National AAU tumbling champion. Tumbling was last contested in the NCAA Championships in 1964.

Events that were part of the earlier U.S. gymnastics competitions but are no longer contested

Rope Climb – From a sitting position on the floor using arms only, the "gymnast" climbed and touched a disc (with lamp black) 20 feet high (a little more than 6 meters). Although it is hard to believe, the world record was 2.8 seconds, first recorded by Don Perry, who matched this time a number of times. Perry won six National Championships and was never defeated in competition. Perry could make the 20 foot climb in six arm strokes and a reach which improved his time over the seven stroke climb, but the six stroke climb was not consistent in that he often missed touching the disc. In order to not lose, he mostly used seven strokes which was how he set the record of 2.8 seconds. Rope climb was contested in both the 1955 and 1959 Pan American Games. Don Perry won in 1955, and Garvin Smith won in 1959 - both men were timed in 2.9 seconds. Years after Perry had competed, two other rope climbers, Robert Manning and Paul Davis, had matched (once each) Perry's 2.8 seconds. This event was disbanded in the NAAU and NCAA Gymnastics Championships after 1962 (Amateur Athletic Union Gymnastics, 1960).

Indian Clubs - were twirled through a variety of intricate patterns (and not tossed), for a 4 minute routine – each minute was judged on a 2½ point basis. This was contested last in the U.S. National AAU Championships in 1953 (Amateur Athletic Union Gymnastics, 1960). Indian clubs were contested in the 1955 and 1959 Pan American Games, with Francisco Alvarez Jr. of Mexico, winning both times. (In the 1940s, Francisco Alvarez Sr. had traveled to the U.S. from Mexico and competed for a number of years in Indian clubs at the National AAU Championships.)

Swinging Rings – From the mid-1940s to 1951, swinging and still ring compulsory and optional exercises alternated yearly in the AAU competitions – one year the compulsory was still rings and the optional was swinging rings, and the next year it was reversed. Then after 1951, swinging rings and still rings were separate events in the AAU competitions. In the NCAA and other college regional conference championships swinging rings were a separate event from still rings. The last NAAU and NCAA Championships in swinging ring for men was in 1962 and 1961 respectively. The women competed in swinging rings in the NAAU from 1933 to 1957 (Amateur Athletic Union Gymnastics Handbook, 1960). It should be noted that, in the U.S., while swinging rings were also referred to as flying rings, the flying rings (for men) in the records of the 1932 Olympic Games were not swinging rings but still rings. Perhaps, the still rings were referred to as flying was because they were not rigid (personal accounts).

Names and Abbreviations: Olympic Games (OG), World Gymnastics Championships (WC), World University Games or Universiade (WUG), Pan American Games (PAG), All-around (AA), floor exercise (FE), pommel horse (PH), still or stationary rings (R), vaulting (V), parallel bars (PB), horizontal bar (HB), uneven bars (UB), balance beam (BB), flying rings (FR), tumbling TU), trampoline (TR), Indian clubs (IC), rope climb (RC).

FIRST PERFORMANCE OF SKILLS (ELEMENTS) BY AMERICANS IN EACH OF THE ALL-AROUND EVENTS

A good number of skills with names of gymnasts which are listed in the FIG Code of Points were not first performed in an Olympic Games or World Championships, while other skills are miscredited or credited to those who did not perform them first or even perform them. With that said, the following skills (elements) are offered as being performed by American gymnasts, perhaps, for the first time in an official competition of some stature.

FE: 1. Joe Kotys, Bob Stout and Abie Grossfeld were the only gymnasts to perform a back salto with a full (360 degree) twist in FE in the OG - 1948, 1952 and 1956 respectively (personal accounts). (After 1956 gymnasts from other countries began using the back full twist salto.) 2. An Endo or a back piked flip flop performed by Abie Grossfeld in the 1953 U.S. National (AAU) Championships. 3. A Tong Fei or butterfly full (1/1) twist performed by William “Bill” Roy in the 1954 NAAU Championships. 4. A back double tuck salto performed by Jamile Ashmore in the 1962 NAAU Championships (April). (Note: A Bulgarian gymnast attempted the back double salto in the 1962 World Championships (in October or November) and crashed, as I remember, his face hitting first and, thus, was not successfully completed. 5 & 6. A dive roll with a full (1/1) and in 1965, and a back dive roll with a 3/2 twists in 1966 by Frank Schmitz in the NCAA Championships of those years. 7. A dive full twist front handspring (or walkover) and back 3/2 twist handspring by Jim Hartung in 1978 World Championships. 8. A jump back ½ twist and 3/2 salto (Arabian 1¾ salto) by Dan Millman in 1966. Note: The U.S. first instituted a floor exercise area with springs for competition in 1978.

PH: 1. William “Bill” Taylor performed a 360 reverse stockli in the 1941 NAAU Championships.

R: 1. A Li Ning or rearward hang front uprise performed by Al Klein in 1949 NAAU Championships. 2. A Nakayama or back lever to cross by Todd DiNicolain the 1948 Metropolitan Senior Gymnastics Championships. 3. A maltese or swallow performed by Leonard Harris and Watts in 1948 and1954 NAAU Championships respectively. 4. A whippet (Honma) was performed by John “Jack” Miles and Jack Sharp on swinging rings in the NCAA Championships in 1949 and/or 1950 (30). 5. A back double salto dismount by Jamile Ashmore in the 1955 Pan American team trials. 6. A back salto 1/1 twist dismount by Abie Grossfeld in 1957 in NAAU Championships. 7 & 8. A back kip to maltese, and maltese press to planch by Carl “Bill” Wolfe in 1962 NAAU Championships. 9. A kip to V hold by Phil Cahoy 1981 World Championships. Note: What is listed as a Pineda may not have been performed by (Tony) Pineda at all but was performed by numerous U.S. gymnasts in the 1940’s. 10. Jim Amerine, for example, performed a held front lever, pull with straight body to a held cross, then lower to held back lever pull to a held cross (Nakayama) in the 1965 North American Championships (personal accounts, viewed on movie films or youtube)

V: A Tsukahara was performed by Harold “Hal” Shaw throughout the 1966-1967 college gymnastics season, including the National Collegiate Championships (NCAA). Shaw also performed it in pike position.

PB: 1. A Diomidov was performed by Warren Wakerlin in 1962 Midwest Open Gymnastics Championship. 2. A Gatson 1 was first performed by Marshall Nelson in the 1997 NCAA Championships. 3. An article with sequence photos of a 1/1 twist stutz to support (Carminucci to support) or “Waddell” appeared in the June 1980 International Gymnast magazine but was performed by Bill Waddell during the 1974-75 collegiate gymnastics competition season and in the 1975 NCAA Championships. 4. The straddled (Stalder) shoot handstand on one rail by Tim Daggett in the 1981 World Championships. 5. From a stand, reach under bars, grasp far rail, jump to an immediate (early) stoop (pike) in back seat circle to V support position on one rail, and the front salto 3/2 twist dismount by Phil Cahoy in 1978 World Championships. 6. In the 1970s, Healy, a high school or junior college gymnast in Illinois, was lowered and held in separate positions by a spotter in four or five still photos (portrayed in a U.S. publication), reversing a Diomidov. There is no account of him ever doing it in competition or that he could actually do the “Healy.” He proceeded to name this skill after himself. However, consider that the Healy was referred to as a heli-twirl as it appeared in an article in the November 1979 issue of the International Gymnast magazine (describing methods of how to learn the skill).

HB: 1. Harold “Hal” Lewis who performed the following skills in the 1949 and/or 1950 NAAU Championships: A front giant hop to double elgrip; a Steinemann (German giant) to a back seat circle piked pull out to a free front support; and the free hip flyaway (hecht) dismount. 2. The Endo was performed by William “Bill” Sims in 1958 U.S. intercollegiate competition and Midwest Open Championships. 3. The Andrianov or back triple salto dismount was performed by Mark Davis in the 1971 NAAU Championships. 4. Kurt Thomas performed from a back giant stoop (pike) in to free back seat circle casting (or lifting) through dorsal handstand and swing through a dorsal hang.

Notable accomplishments of U.S. gymnastics luminaries

MEN

Roy E. Moore (born 1875, died 1957) is regarded as the “father” of American gymnastics, and coached-managed three U.S. Olympic teams – 1920, 1924 and 1928. Mr. Moore was the Chairman of both the U.S. Olympic and National AAU Gymnastics Committees, which he served for over 35 years. He was the first American to serve as an FIG officer, being the Vice President until his death. As a competitor, he represented the New York Turnverein and won five NAAU Championships on PH (1907, ‘08, ‘09, ’12 and ’13) (Moore, 1941; Amateur Athletic Union Official Gymnastics Yearbook, 1957).

Frank Kriz was a product of the Bohemian Sokol of New York, and the first American to compete in three OG (1920, ‘24 and ‘28). Kriz won V in the 1924 Olympic Games and, thus, became the first American gymnast (discarding the all American 1904 second “Olympic” competition) to win a true Olympic Gold medal (see statement under 1924 above).

Alfred "Al" Jochim was the only American to compete in four OG in gymnastics (1924, '28, '32, '36). He won two silver medals - for V and for team in the 1932 Games. In the 1936 OG, Jochim was honored by carrying the American flag in the opening ceremony, leading the U.S. delegation into the stadium. Further, Jochim won the most men's National (AAU) gymnastics championships, at 35 titles, in U.S. history which included seven AA titles (between 1925 and 1934).

George Wheeler, who was on the 1936 Olympic team, had improved tremendously after 1936 and won 25 National titles in five consecutive years (1937-'41), which included five consecutive AA, FE, V, and PB titles. Then, he went into the Navy in World War II, and ended his gymnastics career.

Frank Cumiskey competed in the 1932, '36 and '48 OG, and won a total of 24 National titles, including 5 all-around titles. He won National titles spanning 17 years – the first title was for PH in 1932 and the last title was for HB in 1948. He took a leave of absence from the National Championships for four years (1938 to 1941). In 1948, a few weeks before he turned 36 years old, he placed 6th in PH at the OG (three Finns tied for first). He is also credited with starting the U.S. National Gymnastics Judging Association.

Edward Hennig, from the German Turnverein in Cleveland, tied for first on HB and IC in the 1904 OG, and was also the NAAU Champion. He competed until 1951, a span of 47 years, having won 13 National Indian Club titles, the last at age 71.

Makoto "Mako" Sakamoto competed in two OG (1964, '72) and two WC 1966, '70). He is the only U.S. male gymnast to win all seven national titles in one championships (1965). He won a total of 27 U.S. National championships (ranks second in U.S. National men's titles, including six AA titles (between 1963 and 1970). As a 17 year old, he placed 20th in AA in the 1964 OG. He also placed 3rd in AA in the 1965 WUG, and 12th in AA in the 1970 WC.

Peter Kormann became America's first Olympic individual gymnastics medalist in 44 years (since 1932) winning the bronze medal in FE in 1976, where he tied Nikolai Andrianov for the highest score in finals, at 9.8, and moved from 6th (actually 10th place, because of the two gymnasts per country rule) to 3rd place. (Note: The FIG rules that followed with non-accumulated scores or "new life," Kormann would have been co-Olympic Champion.)

Kurt Thomas, America's first men's World gymnastics champion when he placed 1st in FE in 1978. And, in 1979 WC he again won FE and added the HB. He also placed 2nd in AA, PH, and PB – winning 5 individual medals, plus the team bronze, for a total of 6 medals.

Bart Conner was the first American man to win gold medals (PB) in both the WC (1979) and the OG (1984). He qualified for three OG (1976, '80 and '84) and four WC (1978, '79, '81 and '83).

Peter Vidmar, Olympic PH champion, and 2nd in AA (losing first by .025 points - 1984).

Mitch Gaylord, In 1984 OG, won three individual medals (2nd V, 3rd R and PB) plus the team gold – for a total of 4 medals.

Trent Dimas, Olympic HB champion (1992).

Paul Hamm won the AA at both the World Championships (2003) and the OG (2004) – the only American to do so. He competed in two OG (2000 and '04) and three WC (2000-'03). He broke a bone in his hand just before the 2008 OG.

John Roethlisberger was the most prolific U.S. competitor for the combined WC and OG. He competed in three OG (1992, '96 and '00) and six WC (1991, two in '94 - separate individual and team WC, '95, '97, and '99). He also won four U.S. National AA championships (between 1990 and 1995).

Blain Wilson competed in three OG and four WC, and won five consecutive U.S. National AA elite championships (1996-2000).

Sean Townsend, 2001 WC placed 1st PB.

WOMEN

Helen Schifano (Sjursen) placed second in V at the 1948 OG (where Olympic medals were not awarded to women for individual events). The U.S. women, in the 1948 OG, won its first Olympic gymnastics team medal, placing third.

Clara Schroth (Lomady), 1948 and 1952 Olympian, won the most U.S. National (AAU) Championships, at 38 titles, which included a U.S. record 10 consecutive National BB titles. She also won six AA titles. Note: Prior to 1952, an AA woman gymnast had extra events – FR (although FR remained an event until)1957) and even PBs - besides the tradition four events contested in present day championships. Therefore, female AA gymnasts could win seven medals (including the AA) in a single championships (Maloney, 1953)

Muriel Davis Grossfeld was the first American woman gymnast to compete in three OG (1956, 60, 64). She won the second most official U.S. National women's titles at 17, which included a U.S. record of 8 National FE titles (Amateur Athletic Union Official 1965-1966 Gymnastics Guide and handbook).

Cathy Rigby won America's first medal in the WC when she took the silver medal on BB in 1970 (in the beautiful city of Ljubljana).

Marcia Frederick won America's first women's WC title when she placed 1st on UB in 1978.

Mary Lou Retton won America's first Olympic AA title in 1984, 2nd V, 3rd UB & FE. Won 5 medals in the 1984 OG – the most of any athlete.

Julianne McNamara placed 1st UB and 2nd FE in the 1984 OG, and placed 3rd in UB in the 1981 WC.

Kim Zmeskal won America's first WC all-around title in 1991, 3rd FE; 1992 WC 1st BB & FE; winning a total of 4 WC individual medals.

Shannon Miller became the America's first two time World AA Champion - 1993 and 1994. Also, 2nd UB in 1991 WC; 2nd AA & BB and 3rd UB & FE in 1992 Olympics; 1st UB & FE in 1993 WC; 1st BB in 1994 WC; 1st BB 1996 Olympics (won a total of 5 Olympic and 6 WC individual medals).

Courtney Kupets, 2002 WC 1st UB.

Ashley Postell, 2002 WC 1st BB.

Carly Patterson, 2004 OG 1st AA, 2nd BB; 2003 WC 2nd AA.

Chellsie Memmel, 2005 WC 1st AA, 2nd UB & BB; 2003 WC 1sttie UB.

Hollie Vise, 2005 WC 1sttie UB

Shawn Johnson, 2007 WC 1st AA & FE; 1st BB, 2008 OG 1st BB, 2nd AA & FE. She won 4 medals for each.

Anatastasia "Nastia" Liukin, 2008 OG 1st in AA, 2nd UB & BB, 3rd FE (won 5 medals); 2005 WC 1st UB, 2nd AA & FE; 2006 WC 2nd UB; 2007 WC 1st BB & 2nd UB.

Bridget Sloan, 2009 WC 1st AA.

Kayla Williams, 2009 WC 1st V.

HOW AMERICAN GYMNASTS FARED IN INTERNATIONAL COMPETITION, INCLUDING SOME SPECIAL PERFORMANCES, THROUGH THE YEARS

1904 Olympic Games (in St. Louis)

The first Olympic Games (in St. Louis) in which U.S. gymnasts took part was in 1904. First, some background: Since the Louisiana Purchase Exposition (akin to a World's Fair) was being held in St. Louis in 1904 with James Edward Sullivan being the Chief of Physical Culture, sporting events were held each day of the Exposition, which lasted six months. Sullivan insisted that every event be labeled Olympic. Therefore, a problem with the 1904 OG was to decide which events were truly Olympic caliber - which meant that the events were open to the best amateur athletes of all countries to compete on equal terms. Also, a number of events were not eliminated because only Americans took part - this was commonplace in 1904 with the second

Olympic gymnastics competition, as later explained, being an example (Mallon, 1999).

The total number of all-around (AA) gymnastics competitors were 112 from the USA, five from Germany, one from Austria, and one from Switzerland, and two U.S. one event specialists (Herman Glass who placed 1st on R, and Ralph Wilson who placed 3rd in Indian clubs (IC) for a total of 121 competitors representing just four nations. It should be noted that some of the "American" gymnasts representing the various Turnvereins may have been of foreign nationality, but with records not available, their actual nationality was not determined. One American gymnast Max Emmerich competed both in gymnastics and the separate sport of track and field (athletics) (Mallon, 1999).

There were two different and independent Olympic gymnastics competitions separated in time by almost four months - and both were credited as Olympic competitions (4). The first competition, Turnverein gymnastics, considered of true Olympic caliber, was contested on July 1-2 on the field of the Olympic Stadium, and consisted of the following events: horizontal bar (HB), parallel bars (PB), side horse (PH) and long horse (V), 100 yard run, shot put and long jump. Two compulsory and one optional exercise(s) were performed on PH, V, PB and HB. The records indicate that there were 12 different exercises in the gymnastics competition (Mallon, 1999).

Three sets of medals were awarded for the different parts of the competition: all the events together (apparatus and track and field), for just the apparatus events, and for just the track and field events (all as part of Turnverein gymnastics, which was separate from the sport of track and field competition). In the combined event – apparatus and track and field – the medalists, in this first Olympic competition, were: 1st Julius Lenhart from Austria; 2nd Wilhelm Weber from Germany; 3rd Adolf Spinnler from Switzerland. The best Americans placed 6th (Otto Steffen - although he may have been a German citizen living in the USA) (16,17); 8th (John Bissinger); and 10th (William Merz). American Anton Heida who won the second competition in October (noted later) placed 18th. The medalists for just the gymnastics apparatus part of the competition were all Europeans: 1st Adolf Spinnler, 2nd Julius Lenhart, and 3rd Wilhelm Weber. The best Americans, Otto Steffen placed 6th, George Eyser placed 10th, and Anton Heida placed 12th. The medalists for just the track and field (gymnastics) events were all Americans: 1st Max Emmerich, 2nd John Grieb, and 3rd William Merz (Mallon, 1999).

Summarizing the first gymnastics competition held on July 1-2, which consisted of 112 Americans and 7 Europeans, the Americans won no gymnastics apparatus medals or the apparatus combined with track and field medals. They only won medals (gold, silver and bronze) for just the track & field (gymnastics) events.

Also contested was a team competition which consisted of thirteen (13) American Turnvereins from different U.S. cities. The results, with apparatus work being weighted more than the track & field events, were as follows: 1st Philadelphia; 2nd New York; 3rd Central, Chicago; 4th Concordia, St. Louis; 5th South

St. Louis; 6th Norwegier, Brooklyn, NY; 7th Vorwarts, Chicago; 8th Davenport, Iowa; 9th LeSalle, Chicago; 10th Passaic, New Jersey; 11th Milwaukee; 12th Socialer, Detroit; and 13th Vorwarts, Cleveland (4). Note: Julius Lenhart, an Austrian citizen, competed for the winning Philadelphia Turngemeinde team (Mallon, 1999; Cumiskey, 1984).

The separate second gymnastics competition was not truly Olympic in nature in that gymnasts from only one country, with just a total of 10 competitors (five AA and five specialists) took part(17) and, thus, should have been considered, at best, of marginal Olympic caliber That competition was held on October 28 and 29, was referred to as Swedish gymnastics, consisting of only apparatus work. Events contested were the AA, PH, R, V, PB, HB, RC and IC (Mallon, 1999). Therefore, this one competition determined the National champions and a separate set of "Olympic champions."

Results of the (U.S.) gymnasts were: Anton Heida, 1st AA, PH, V (tied), and HB, 2nd PB, thus, winning four individual gold and 1 silver medal(s); George Eyser, 1st in V (tied) and RC; 2nd AA, PH, and PB – won 3 gold, 2 silver and 1 bronze medal(s); William Merz won 1 silver and 4 bronze medal(s); Edward Hennig 1st on HB and IC - won 2 gold medals; John Grieb won 1 gold and 1 silver medal; Charles Klause won 1 silver and 1 bronze medal, and John Duha, who was the youngest gymnastics medalist at 16 years of age, won 2 bronze medals (Mallon, 1999).

All the medals (gold, silver and bronze) in this second competition were won by Americans - no surprise - since athletes from other countries were not in the competition. Note: Both sets of Olympic results (from the July and the October competitions) are not usually displayed in publications listing Olympic Champions (personal accounts).

George Eyser, in these 1904 OG, was the oldest gymnastics medalist at age 32. He had lost a leg as a result of a train accident when he was a child, had a wooden leg and, amazingly, tied for first in vaulting. Eyser, who was excellent on the gymnastics apparatus could, understandably, not do well in the track and field events (Mallon, 1999; Wallechinsky, 2004).

Also, contested in August, 1904 in St. Louis, was a non-Olympic event - the YMCA Gymnastics Championships. The gymnastics events contested were the AA, PH, V, PB, and HB. In addition, there was a team championships consisting of high jump, marching calisthenics and apparatus, basketball and a relay race (Mallon, 1999).

<u>1905 – 1919</u>

The U.S. did not take part in the 1908 and 1912 Olympic Games in gymnastics . Between 1905 and 1919, gymnasts representing various Turner clubs won at least twice as many U.S. National individual championships than the gymnasts that represented the Sokols, YMCAs, athletic clubs, and universities (Moore, 1941).

<u>1920 Olympic Games (in Antwerp)</u>

The Americans did not participate internationally again until the 1920 OG, where just four gymnasts represented the U.S. The U.S. gymnasts competed in the combined individual event (AA). Frank Kriz, the highest American in the AA placed 10th (out of 25 competitors). The U.S. gymnasts came from the New York Turners, Norwegian Turners (Brooklyn), Philadelphia Turners, and Los Angeles Athletic Club. The teams from other countries (all European) vying for the Olympic team competition had from 16 to 26 gymnasts on their teams (Mallon & Bijkerk, 2003).

<u>1924 Olympic Games (in Paris)</u>

The U.S. <u>men's</u> team placed 5th. Frank Kriz, from the Bohemian Sokol in New York, won vaulting and, aside from the all American 1904 Olympic second gymnastics competition, became in 1924 America's first true Olympic Gymnastics Champion. Kriz placed 6th in RC, 8th on PH, and 19th AA, the highest place among the Americans. Max Wanderer placed 5th in V.

<u>1928 Olympic Games (in Amsterdam)</u>

The U.S. <u>men's</u> team placed 7th. The top U.S. gymnast in the AA was Alfred Jochim in 36th place. At least three members of the 1928 Olympic team came from the New York Turners. Frank Haubold, one of the 1928 Olympians, once told me that the same pommel horse, in which I and others were training on in 1958 at the Union City (NJ) Swiss Turners, was brought to the 1928 Olympic Games in Amsterdam for training. It still had the same leather cover and that was a very used PH over those 30 years, especially when considering all the Olympians that had come from that club. "The leather must have come from a very healthy animal."

1932 Olympic Games (in Los Angeles)

Due to the world (financial) depression and the great distance to travel from Europe to the U.S., just 46 athletes representing six countries took part in gymnastics at the 1932 OG. The U.S. men's gymnastics team placed 2nd out of five teams. Also, 24 gymnasts competed in the AA, with the U.S. gymnasts placing 6th (Frank Haubold), 7th (Frederick Meyer), 9th (Alfred Jochim), and 10th (Frank Cumiskey). Further, the maximum number of gymnasts that competed for medals in each of the AA events was 14 for R and PB, 12 for HB, 10 for PH, and 9 for V. The special events (non-AA) TU, IC and RC had totals of 4, 4 and 5 competitors respectively, which translated to only one, one and two competitors in these events that did not win an Olympic medal. The U.S. gymnasts place finishes and/or won the following individual medals: Frank Haubold, Frank Cumiskey and Alfred Jochim placed 3rd, 4th and 6th on PH respectively; Alfred Jochim, Ed Carmichael and Marcel Gleyre placed 2nd , 3rd and 5th in V respectively; U.S. Rings specialists placed 1st (George Gulack, former FIG Executive Committee), 2nd (Bill Denton), and 4th (Richard Bishop); Dallas Bixler, a specialist, placed 1st on HB; TU specialists placed 1st (Rowland Wolfe), 2nd (Edwin Gross) and 3rd (William Hermann); RC specialists placed 1st (Raymond Bass), 2nd (William Galbraith) and 3rd (Thomas Connolly); IC specialist placed 1st (George Roth), 2nd (Philip Erenberg) and 3rd (William Kuhlemeier) (The Games of the Xth Olympiad Los Angeles 1932 Official Report, 1933).

1936 Olympic Games (in Berlin)

The U.S. women gymnasts first took part in the OG in 1936, with their team placing 5th. U.S. gymnast Connie Caruccio (Lenz) placed 3rd on UB, 4th in AA and BB (15), however individual event or AA medals were not awarded to women. The U.S. men's team placed 10th. The top U.S. gymnast in the AA was Frank Cumiskey who placed 48th.

1947 International Competition between the Czech and the U.S. men (in New York City)

Before 1947, the elite level American gymnasts only had one international gymnastics competition every four years - the Olympic Games. In 1947, the Czech men's team came to the United States and

competed against the American team in the New York Sokol Hall, which was the first U.S. international dual gymnastics meet. The 1936 Olympic rings champions Alois Hudec won the AA, with the American gymnasts, Paul Fina and Edward "Ed" Scrobe taking 2nd and 3rd respectively. The Czechs beat the Americans by 3.7 points. William "Bill" Roetzheim, who years later served on the FIG Technical Committee, competed in his first international competition (as did the other U.S. gymnasts, except for Arthur Pitt who had competed in the 1936 OG). Roetzheim, just 18 years old, finished 11th (out of 12) in the AA (Amateur Athletic Union Official Gymnastics Yearbook, 1948)

1948 Olympic Games (in London)

The U.S. men's team placed 7th. The top U.S. gymnast in the AA was Ed Scrobe, placing 44th. In these Games, Frank Cumiskey (1932, '36 and '48 Olympian), a month before turning 36 years old, received the 4th highest score on PH but since three Finns tied for first, and two Italians were next, Cumiskey finished 6th. The women's team won America's first team medal, placing 3rd. U.S. gymnast Helen Schifano (Sjursen) placed second in V, but medals were not awarded to women for individual events. She was the U.S. high scorer in the AA, placing 14th.

1950 (in Japan)

In 1950, three American men traveled to Japan and competed against three Japanese gymnasts in two competitions. The legendary gymnast Masao Takemoto placed 1st AA in both competitions. The American gymnasts - Ed Scrobe, Bill Roetzheim and Joseph "Joe" Kotys - occupied the next three AA places in both competitions, followed by the other two Japanese gymnasts. The U.S. won the team competition by 22.2 points (22). In the years that followed, as is common gymnastics knowledge, the Japanese men gymnasts markedly improved, becoming the world's best by 1960. The next dual competition in Japan between these two nations would not occur until 33 years later, in 1983 (personal accounts).

1951 Pan American Games (in Buenos Aires)

The first PAG were held in Buenos Aires in 1951. The U.S. had just one entry in the gymnastics competition, Bill Roetzheim, who financed his own trip, and won the AA (Amateur Athletic Union Official Gymnastics Yearbook 1952; Bushnell, 1952).

1952 Olympic Games (in Helsinki)

(Amateur Athletic Union Official Gymnastics Yearbook, 1951) The U.S. men's team placed 8th. The top U.S. gymnast in the AA was Ed Scrobe who placed 30th. American Robert "Bob" Stout received the highest optional FE score of 9.85 (but competed in compulsory exercises at 8 AM and received scores of 9.9, 9.5, 9.1, 9.0 for an average of 9.3) (Amateur Athletic Union Official Gymnastics Yearbook, 1953) and tied for 7th place (Bushnell, 1952). The U.S. women's team placed 15th. Marion Barone was the top U.S. AA gymnast in 64th place (Amateur Athletic Union of the United States Gymnastics Yearbook, 1953).

1954 World Championships (in Rome)

In 1954, two American gymnasts competed in the World Championships – Charles Simms and John "Jack" Beckner (who was injured, spraining his wrist, during the compulsory HB exercise, and had to withdraw from the competition). Charles Simms placed 89th in AA.

1955 Pan American Games (in Mexico City)

The first full U.S. national gymnastics team (men) that was sent to a foreign country, other than the Olympic Games, was to Mexico City at the PAG in 1955. The U.S. men totally dominated the competition winning all the gymnastics events (including TU, TR, and RC) except for IC where the U.S. placed 2nd and 3rd. U.S. gymnasts occupied the top five places in the AA. Jack Beckner placed 1st in the AA, FE, PH and PB tie. Richard Beckner (Jack's brother) tied for 1st on PB, and R. Joe Kotys won V. Also, the U.S. gymnasts placed in the top three in five of the six AA events, winning a total of 11 of 12 gold medals, and 20 out of 21 possible medals for the "Olympic" AA events (Amateur Athletic Union Official Gymnastics Yearbook, 1956).

1956 Olympic Games (in Melbourne)

The U.S. men's team placed 6th. Of the six competing members of the 1956 Olympic team, five were from Los Angeles and one from New York City. The highest American in the AA was Jack Beckner who placed 17th. He also placed 7th in both vaulting and horizontal bar.

The U.S. women's team placed 9th, and Sandra Ruddick was the top U.S. AA gymnast in 51st place.

1958 World Championships (in Moscow)

1958 marked the first time a full U.S. team (men) took part in the World Gymnastics Championships (in Moscow). The U.S. men's team placed 7th, and Jack Beckner was the top AA gymnast at 28th. Art Shurlock had tied for 6th place (in the qualifying round of the team and AA competition) on PH but did not compete in the six men PH finals due to the tie breaking rule. After the WC, the U.S. team (men) traveled to Finland and had a dual meet out doors with the Finns in Jyuvaskula (it was very cold) (personal accounts).

1959 Pan American Games (in Chicago)

The U.S. men's team, as in the previous PAG, totally dominated the competition winning all the events except IC, plus the top three places in the AA and in three of the six events - with a total of 11 gold medals, and 18 out of 21 possible medals for the "Olympic" AA events. Jack Beckner placed 1st in the AA, V and PB. Abie Grossfeld placed first on in FE, R (tie), HB, 2nd in AA, 3rd on TR and TU, winning a total of 7 medals with 4 golds (including the team gold). Jamile "Jay" Ashmore tied for 1st on R. Greg Weiss placed 1st on PH. Other than the Olympic Games, the first U.S. women's international gymnastics team competition occurred in the 1959 PAG (Chicago), which they won. However, Ernestine Russell of Canada won 4 gold medals which included the AA. Theresa Montefusco placed 1st on BB and 2nd FE. Betty Maycock placed 2nd in AA, UB and V.

1960 Olympic Game (in Rome)

The U.S. men's team competed both days - compulsory and optional exercises - in the first session, starting at 8 AM, and finished in 5th place (4th in compulsories and 7th in optionals). Larry Banner finished highest in AA among the U.S. gymnasts in 21st place. The U.S. women's team placed 9th, with Gail Sontegrath being the top AA gymnast in 28th place.

1961 European Tour, plus other international competitions

In January, the Soviet National men's and women's teams toured the U.S. and had dual meets – the men at Pennsylvania State University and the women at West Chester State College in Pennsylvania. Months later, the Japanese National men's and women's team visited the U.S. and entered the NAAU Championships (the rule was that any amateur in the world could compete in the NAAU Championships). The Japanese men won all the events, and their women won all but FE, which was won by Muriel Grossfeld. The U.S. National men's and women's team toured Europe and competed in Prague against the Czech team who won, in Moscow against the Soviet team who won, and in Warsaw against the Polish team whose men lost and their women won. In Moscow's Luzhniki Arena, the U.S. team members met and shook hands with Yuri Gagarin and Gherman Titov (the first two men to travel in space) – who were special guests at the competition.

1962 World Championships (in Prague)

The U.S. men's team placed 6th (13th in compulsories and 3rd in optionals). Don Tonry was the top U.S. AA gymnast at 21st. Just after the WC, the U.S. men's and women's team traveled from Prague to Berlin and had a dual meet with the Germans. The first U.S. women's team to compete in the WC was in 1962 (Prague). Their team placed 8th, with Muriel Grossfeld being the top AA gymnast in 31st place.

1963 Pan American Games (in Sao Paulo)

Both U.S. men's and women's team placed 1st. Don Tonry placed 1st in PB and 2nd in AA. Jay Ashmore placed 1st in R. Garland "Gar" O'Quinn placed 1st in PH. Abie Grossfeld placed 1st in HB and 2nd in R. Doris Fuchs placed 1st in AA, UB and BB. Avis Tieber placed 1st in FE and 2nd in V.

Dale McClements placed 1st in V, 2nd in AA and UB.

1964 Olympic Games (in Tokyo), and dual meet with the Czechs

The U.S. men's team placed 7th. American Rusty Mitchell performed the first back double salto in FE in the OG. Makoto Sakamoto, age 17, was the top U.S. gymnast in the AA at 20th place. The U.S. women's team placed 9th, and Dale McClements was the top AA gymnast in 34th place. The Czech men's and women's teams met the Americans in dual meets in the U.S. and won.

1965 World University Games or Universiade (in Budapest), the World Gymnastsrada, and a competition in England

In March, three U.S. men and women National team members traveled to London and competed against the British National team gymnasts in Wembley Arena – both U.S. men and women won their respectively competitions. The U.S. national men's and women's team took part in the World Gymnastrada in Vienna. From Vienna American Makoto Sakamoto traveled to Budapest to compete in the WUG. He placed 3rd in AA. Akinori Nakayama (Japan) placed 1st, and the great Slovenian gymnast Miroslav Cerar placed 2nd.

1966 World Championships (in Dortmund)

Just prior to traveling to Germany for the WC, the U.S. men's team had a dual meet against the Norwegian team in Sandefjord. The American team won the competition.

At the WC, both the U.S. men's and women's teams placed 6th. The men were just two tenths (.2) behind the 5th place Poles, and eight tenths (.8) behind the 4th place Czechs. Makoto Sakamoto was the top American in the AA who placed 16th.

In the women's competition, the audience sensed that American Doris Fuchs-Brause was underscored for her UB optional exercise at 9.866, when compared to the 9.9 and higher scores that the Soviet and Czech women gymnasts had received for their uneven bars in the session before the Americans. The audience rebelled by whistling and jeering so loud that the competition could not be continued for over an hour. Her score was not changed (personal accounts). Fuchs-Brause placed the highest among the Americans in AA in 27th place.

1967 Pan American Games (in Winnipeg), and World University Games (in Tokyo)

PAG - The U.S. men's and women's team placed 1st. Fred Roethlisberger placed 1st in AA, PB (tie) and 2nd on R (tie). Richard Loyd tied for 1st in PB. Mark Cohn placed 1st on PH and tied 2nd in R. Linda Metheny placed 1st in AA, V, FE, and 2nd on UB. Joyce Tanac placed 2nd in AA, and Marie Walther placed 3rd in AA and V. Kim Chace placed 2nd in FE. Donna Schaenzer placed 2nd in V. WUG – Linda Metheny tied for 2nd in AA.

1968 Olympic Games (in Mexico City)

The U.S. men's team placed 7th. The top place American finisher in the OG AA was David Thor, placing 24th. Thor also tied with four other gymnasts for 4th on PH in the qualifying competition but due to the tie breaking rule, he did not compete in the six men event finals. The U.S. women's team placed 6th. Cathy Rigby, as the U.S. high scorer in AA, placed 16th. Linda Metheny became the first American to qualify for an apparatus finals, in 3rd place in BB. She finished in 4th place after event finals.

1970 World Championships (in Ljubljana), and the World University Games (in Turin)

WC - The U.S. men's team placed 7th. In the men's competition Makoto Sakamoto was the U.S. top AA male gymnast in 12th place. Cathy Rigby won America's first medal in the WC – silver on BB, and was the top U.S. AA finisher in 15th place. The U. S. women's team placed 7th. Joan Moore, another prominent U.S. gymnast, placed 21st in AA. Just after the WC, the U.S. team traveled to Zurich for a dual meet with the Swiss. WUG – The U.S. men's team placed 3rd.

1971 World Cup (in Miami), the International USSR Cup (in Moscow), and the Pan American Games (in Cali)

World Cup - U.S. gymnast John Crosby placed 1st in FE and V. International USSR Cup - Crosby tied for first place in FE with Olympic Champion Akinori Nakayama. PAG - John Crosby won the maximum of 8 medals, which included among his top three places, 1st in FE and R, 2nd in PB and 3rd AA. John Ellas placed 1st in PBs. The U.S. U. men's team placed 2nd. The U.S. women's team placed 1st. Roxanne Pierce placed 1st in AA, UB and V. Linda Metheny placed 1st in FE, and 2nd in AA and UB. Kim Chace placed 1st in BB, 2nd in FE and 3rd AA.

1972 Olympic Games (in Munich)

The U.S. men's team placed 10th. Makoto Sakamoto, the best U.S. gymnast competed with a torn bicep, which occurred three weeks prior to competition in the OG, which very much hurt the team's placing (personal accounts). Steve Hug had the top U.S. AA finish in 31st place. The U.S women's team placed 4th. Cathy Rigby was the top U.S. AA finisher in 10th place. Joan Moore performed the first back salto with double twist in FE (along with Soviet gymnast Lyudmila Turischeva) in the OG (personal accounts).

1974 World Championships (in Varna), and the International USSR Cup (in Moscow)

WC - U.S. men's team tied for 7th place. Wayne Young was the highest American in AA at 25th place, with Steve Hug placing 26th. U.S. women placed 7th. Joan Moore-Rice, the highest American in AA, placed 18th. International USSR Cup – John Crosby placed 1st (for the second time) in FE.

1975 Pan American Games (in Mexico City)

The U.S. men's team placed 1st. Peter Kormann placed 1st in FE. Kurt Thomas placed 2nd in PH and V. Gene Whelan 2nd in PB. The U.S. women's team placed 1st.

1976 Olympic Games (in Montreal), and International Champions-All (in London)

The U.S. men's team placed 7th. U.S. gymnast Peter Kormann placed 3rd in FE marking the first U.S. gymnast who won an individual medal in the OG since 1932 or in 44 years, and he placed 15th in AA. Wayne Young had the top U.S. AA finish in 12th place. The women's team placed 6th, with Kim Chace had the top U.S. AA finish in 14th place. American Peter Kormann placed 1st in AA in the International Champions-All Cup.

1978 World Championships (in Strasburg)

The men's team placed 4th. Kurt Thomas won America's first men's WC gold medal - in FE. He also had the top U.S. finish in the AA at 6th place. Bart Conner placed 9th in AA, and 5th on PBs and 7th on PH. The U.S. women's team placed 5th. Marcia Frederick won America's first women's WC gold medal - for UB (she was the first competitor in UB event finals). American Kathy Johnson was 3rd on FE, and 8th in AA, and Rhonda Schwandt placed 4th in V (tied for the highest score in finals), and 9th in AA.

1979 World Championships (in Fort Worth), Pan American Games (in San Juan), and World University Games (in Mexico City)

WC - U. S. men's team won its first WC team medal, placing 3rd. Kurt Thomas won two gold medals - FE and HB. He also placed second in AA, PH, and PB – for a total of 6 medals. Bart Conner placed 1st in PB, and 3rd in V, and 5th in AA and FE. Jim Hartung placed 9th in AA. The U.S. women's team placed 6th. Christa Canary was 5th in V. Leslie Pyfer placed 12th in AA, and 8th in FE. PAG - No U.S. teams entered. Jeanne Creek placed 1st in FE and 2nd in AA, Jackie Cassello placed 1st in V and 2nd in BB. Heidi Anderson placed 2nd in FE WUG – The U.S. women's team placed 3rd.

1981 World Championships (in Moscow)

The U.S. men's team placed 5th. Peter Vidmar placed 4th in PH and HB. Bart Conner, Peter Vidmar and Jim Hartung placed 11th, 13th, and 15th in AA respectively. The U.S. women's team placed 6th. Julianne McNamara placed 3rd in UB. Tracee Talavera placed 3rd in BB. Kathy Johnson, the U.S. highest place in AA, placed 15th.

1982 (in Gainesville, Florida)

The U.S. men's gymnastics team defeated the Soviet Union's team for the first time (in a dual meet).

1982 DTB Pokal (in Germany)

The U.S. men's team placed 1st, beating the DDR (East Germany), perhaps, for the first time.

1983 World Championships (in Budapest), Pan American Games (in Caracas), and World University Games (in Edmonton)

WC - The U.S. men's team placed 4th. The American AA places were Mitch Gaylord 8th, Peter Vidmar 9th and Bart Conner 11th. Conner was also 5th in FE, 7th in PH, and 6th in PB.

The U.S. women's team placed 7th. The U.S. highest finish in AA was Kathy Johnson in 11th place, and finished 8th in FE. McNamara was the next best finish in AA in 16th place, and placed 7th in UB.

PAG - The U.S. Women's team placed 1st. Yumi Mordre placed 1st in FE and 2nd in AA. Lucy Wiener placed 1st in UB. Lisa Wittwer placed 2nd in UB.

WUG – The men's team placed 3rd. Jim Hartung placed 2nd in R, 3rd in PB and HB. Peter Vidmar placed 3rd in R.

1984 Olympic Games (in Los Angeles)

Although a number of nations boycotted the Olympic Games, the U.S. men's team won its first Olympic team gold medal beating the reigning World Champion Chinese team (by .6 points), who had defeated the Soviet Union's team eight months before in Europe. Peter Vidmar won the gold medal on PH (tying Li Ning) and placed 2nd in AA, losing to Koji Gushiken by 25 thousands of one point or .025. Bart Conner won the gold medal in PB. Mitch Gaylord won three individual medals – 2nd V, 3rd R and PB, and introduced the Gaylord 2 in the HB (which is a release of the bar from back giant swings and executing a back one-and-a-half salto with a half twist over the bar and regrasping the bar). Tim Daggett placed 3rd in PH. The men won 3 gold medals and a total of 8 medals. The women's team placed 2nd. Mary Lou Retton won America's first gold medal in AA. She also placed 2nd in V, and 3rd on UB and FE, winning a total of 5 medals. Julianne McNamara placed 1st in UB. Kathy Johnson was 3rd in BB. The women had won 3 gold medals, for a total of 7 medals.

1985 World Championships (in Montreal)

The U.S. men's team placed 9th Scott Johnson was the top U.S. AA finish in 22nd place. The U.S. women's team placed 6th. Sabrina Mar was the top U.S. AA finish in 14th place, with Marie Roethlisberger placing 17th.

1987 Pan American Games (in Indianapolis)

The U.S. mens team placed 1st. Scott Johnson placed first in AA, PB, R, and 2nd in FE, PH, V and HB, and he won a maximum total of 8 medals. Tim Daggett placed 1st in PH, and 3rd in AA. The U.S. women's team placed 1st. Sabrina Mar placed 1st in AA, and 2nd in FE and UB. Melissa Marlowe placed 1st in UB. Kristie Phillips placed 1st on FE and 2nd in AA. Kelly Garrison placed 1st in BB and 3rd in AA.

1988 Olympic Games (in Seoul)

The U.S. women's team placed 4th but would have placed 3rd, due to them receiving a .5 deduction because of the alternate gymnast (doing the duty of a coach) remained on the platform after removing the board for the UB compulsory mount. Not knowing what to do after the board was moved, the alternate gymnast was instructed to stay on the platform and kneel down which she did, well off to the side of the bars, not obstructing any view. Remaining on the platform violated a rule in the Technical Regulations and the team received a .5 deduction, imposed by the FIG Technical President Ellen Berger (of the DDR) and the U.S. team lost to the DDR by .2. (In over 50 years of being at world and Olympic competitions, this is the only time I have ever seen this rule imposed.) Phoebe Mills placed 3rd on BB, and Brandi Johnson placed highest among the American's in AA, in 10th place. The U.S. men's team competing in the first session both days, placed 11th (but 8th in Optionals). Charles Lakes was the top U.S. AA gymnast at 19th place (his lowest score in AA finals was 9.7, and highest score was 9.95 for HB).

1991 World Championships (in Indianapolis)

The U.S. women's team place 2nd, winning its first team medal in the WC. Kim Zmeskal won America's first AA gold medal in the WC. She also placed 3rd in FE, and 7th in V. Shannon Miller placed 2nd in UB, 4th in FE, 6th in AA and V. Betty Okino placed 3rd in BB, and 4th in AA. The U.S. men's team placed 5th, and Scott Keswick placed 10th in AA, and 4th in HB. Jarrod Hanks placed 16th in AA.

1991 Pan American Games (in Havana), World University Games (in Sheffield)

PAG - Mike Racanelli placed 1st in FE. Bill Roth placed 2nd in HB.The U.S, women's team placed 1st. Chelle Stack placed 1st in FE. Stephanie Woods placed 1st in BB. Hilliary Anderson placed 2nd in UB. Anne Woyernowski placed 2nd in V. WUG – The U.S. women's team placed 2nd. Chari Knight placed 3rd in UB, Kristen Kenoyer placed 3rd in FE. Dominick Minicucci placed 3rd in PH.

1992 World Championships (in Paris – no team or AA)

Kim Zmeskal placed 1st on BB and FE. Betty Okino placed 2nd in UB, and 8th in BB. Kerri Strug placed 6th in V, and 7th in UB. Paul O'Neill placed 4th in R. Mark Sohn placed 7th in PH.

1992 Olympic Games (in Barcelona)

The U.S. men's team placed 6th. American Trent Dimas competed his compulsory exercises during the first morning session, yet won, against the odds, the gold medal on HB. Scott Keswick had the highest U.S. finished in AA at 19th. Chris Waller placed 5th on PH. Jair Lynch placed 6th on PB. The U.S. women's team placed 3rd. Shannon Miller won four individual medals - 2nd in AA and BB, and 3rd on UB and FE tie, and 6th in V. Kim Zmeskal placed 10th in AA, and 6th in FE, and 8th in V. Betty Okino placed 6th on BB, and 12th in AA.

1993 World Championships (in Birmingham – no team) and World University Games (in Buffalo)

WC - Shannon Miller won three gold medals – AA, UB, and FE. Kerri Strug placed 5th in AA and V, and 6th in FE. Dominique Dawes placed 2nd in UB and BB, and 4th in AA (placed 3rd in qualifying round). The U.S. women won 5 medals. Scott Keswick was the top U.S. AA male gymnast in 9th place, and placed 7th on R and HB. Chris Waller placed 6th on PH. WUG – The U.S. men's team placed 3rd. Scott Keswick placed 2nd in R. The U.S. women's team placed 2nd. Tammy Marshall placed 2nd in FE. Hope Sheeley placed 3rd in V.

1994 World Championships (in Brisbane-individual & AA, and Dortmund-team)

The U.S. women's team place 2nd. Shannon Miller won gold in AA and BB, and 4th in FE. Dominique Dawes placed 5th in AA, 4th in UB, 6th on BB and FE. Amanda Borden placed 8th in UB. American Paul O'Neill place 2nd in R, who performed a stretched body Guczoghy, thus having it named for him. American Mark Sohn who had tied for 1st in PH in the qualifying round, placed 6th in finals, where he performed a 360 degree kehre and the skill (element) was, subsequently, named for him. The U.S. men's team placed 9th, with the two top AA places by Scott Keswick in 13th, and John Roethlisberger in 17th.

1995 World Championships (in Sabae), Pan American Games (in Mar del Plata, Arg), and World University Games (in Fukuoka)

WC - The U.S. women's team placed 3rd. Dominique Moceanu had the top U.S. AA finish in 5th place, and placed 2nd in BB. Shannon Miller placed 12th in AA, 4th in BB, and 7th in UB. Kerri Strug placed 7th in AA. Jaycie Phelps placed 8th in UB. The U.S. men's team placed 9th. Blain Wilson had the U.S. highest place in AA in 25th. Mihai Bagiu placed 5th in PH. John Roethlisberger placed 8th in R. PAG – The U.S. men's team placed 1st. Bill Roth placed 2nd in FE, Mihai Bagiu placed 2nd in

PH, and John Roethlisberger placed 2nd in AA and R. The U.S. women's team placed 1st. Shannon Miller placed 1st in AA, UB, FE, and 2nd in V. Amy Chow place 1st in V, 2nd in UB and 3rd in AA. Amanda Borden placed 1st in BB, and 2nd in FE. WUG – The U.S. women's team placed 2nd. Karin Lichey placed 2nd in AA. Heidi Hornbeek placed 2nd in UB and 3rd in BB.

1996 World Championships (in San Juan – no team or AA)

Dominique Dawes placed 3rd in BB. Jaycie Phelps placed 7th in BB (3rd in the qualifying session), and 8th in UB. Chainey Umphrey placed 5th in HB. Chris LaMorte placed 7th in R (3rd in the qualifying competition).

1996 Olympic Games (in Atlanta)

The women won America's first Olympic team gold medal. Shannon Miller won gold in BB.

Amy Chow tied for 2nd place on UB. Dominique Dawes placed 3rd in FE, 4th UB, and 6th in V. The highest U.S. woman in the AA was Shannon Miller at 8th place. Dominique Moceanu place 9th in AA, 4th in FE and 6th in BB. The U.S. men's team placed 5th. American Jair Lynch placed 2nd in PB. The U.S. men's team placed 5th. American Jair Lynch placed 2nd in PB. The highest U.S. man in the AA was John Roethlisberger in 7th place. Blain Wilson placed 10th in AA, and tied for 7th in R.

1997 World Championships (in Lausanne), and World University Games (in Catania)

WC – The U.S. men's team placed 5th. Blaine Wilson was the highest U.S. AA gymnast in 10th place The U.S. women's team placed 6th. Kristen Maloney was the highest U.S. AA gymnast in 13th place, and placed 7th in BB. Dominique Moceanu placed 14th in AA. Mohini Bhardwaj placed 5th in V. WUG – The U.S. women's team placed 2nd. Shannon Miller placed 1st in AA, Kathleen Shrieves placed 2nd in AA, and 3rd in UB. Leah Brown placed 3rd in V.

1999 World Championships (in Tianjin), and Pan American Games (in Winnipeg)

WC - The U.S. women's team placed 6th. Elise Ray was the highest U.S. AA gymnast in 8th place, and placed 7th in UB. The U.S. men's team placed 6th. Blaine Wilson was the highest U.S. AA gymnast in 4th in place. PAG - The U.S. women's placed 2nd. Morgan White placed 1st in AA. The men's team placed 2nd.

2000 Olympic Games (in Sydney)

The U.S. women's team placed 4th. Elise Ray was the top U.S. woman AA finish in 13th place, and was 8th in BB. Amy Chow was 14th in AA. The U.S. men's team placed 5th. Blaine Wilson was the top U.S. AA finish in 6th place. Paul Hamm finished 8th in AA.

2001 World Championships (in Ghent – no team)

The U.S. men's team placed 2nd. Sean Townsend placed 1st in PB, and 8th in AA. Paul Hamm was the U.S. top AA finish in 7th place. Steve McCain finished 4th in FE. The U.S. women's team placed 3rd. Tasha Schwikert was the U.S. top AA finish in 6th place, and placed 5th in BB. Katie Heenan placed 3rd in UB. Tabitha Yim U.S. second best AA finish at 7th, and 6th in FE. Mohini Bhardwaj was 7th in V.

2002 World Championships (in Debrecen – no team or AA)

American Courtney Kupets placed 1st in UB. Ashley Postell placed 1st in BB. Samantha Sheehan placed 3rd in FE. American Paul Hamm placed 2nd in FE.

2003 World Championships (in Anaheim), and Pan American Games (in Santo Domingo)

WC - U.S. women's team won its first team WC. Americans Carly Patterson placed 2nd in AA, and Chellsie Memmel and Holly Vise tied for 1st place in UB. The U.S. men's team placed 2nd. Paul Hamm placed 1st in AA and FE. PAG – U.S. men's team placed 3rd. David Durante placed 2nd in AA. The U.S. women's team placed 1st. Chellsie Memmel placed 1st in AA and UB, and 2nd in BB. Nastia Liukin placed 1st in BB, 2nd in UB, 3rd BB and FE. Tia Orlando placed 1st in FE. Courtney McCool placed 2nd in V.

2004 Olympic Games (in Athens)

The U.S. women's team placed 2nd. Carly Patterson placed 1st in AA and 2nd in BB. Annia Hatch placed 2nd in V. Terin Humphrey placed 2nd in UB. And, and Courtney Kupets placed 3rd in UB. The U.S. men's team placed 2nd. Paul Hamm placed 1st in AA and 2nd HB.

2005 World Championships (in Melbourne – no team)

Chellsie Memmel placed 1st AA, 2nd UB and BB. Nastia Liukin placed 1st UB and BB, 2nd AA and FE. Alicia Sacramone placed 1st in FE and 3rd in V. The U.S. women won all the first places or 4 gold medals and a total of 9 medals, more than twice that of the team with the second most medals.

2006 World Championships (in Aarhus)

U.S. women's team placed 2nd. American Jana Bieger placed 2nd AA and FE. Nastia Liukin placed 2nd UB. Alicia Sacramone placed 2nd in V. The U.S. women won 5 medals but no gold. The U.S. men's team placed 13th. Alexander Artemev placed 3rd in PH.

2007 World Championships (in Stuttgart), Pan American Games (in Rio de Janeiro), and World University Games

WC - The U.S. women's team placed 1st. Shawn Johnson placed 1st in AA and FE. Nastia Liukin placed 1st in BB and 2nd in UB. Alicia Sacramone placed 2nd in FE and 3rd in V. The U. S. men's team placed 4th. Also, the men had three 4th place finishes on individual events - Jonathan Horton in AA, Guillermo Alvarez in FE, and Kevin Tan in R. PAG – The U.S. men's team placed 3rd. Justin Spring placed 2nd in PB. Sean Golden placed 2nd in R. Guillermo Alvarez placed 2nd in FE. The U.S. women's team placed 1st. Shawn Johnson placed 1st in AA, UB and BB, and 2nd in FE. Rebecca Bross placed 1st in FE, 2nd in AA. Nastia Liukin placed 2nd in UB and BB. Ivana Hong placed 3rd. in AA. Amber Trani placed 2nd in V. WUG – Derek Helsby placed 3rd in PH.

2008 Olympic Games (in Beijing)

U.S. women's team placed 2nd, and won a total of 8 medals. Nastia Liukin placed 1st in AA, 2nd in UB and BB and 3rd in FE. Shawn Johnson placed 2nd in AA and FE, 1st in BB, winning a total of 4 medals. The men's team placed 3rd. Jonathan Horton placed 2nd in HB.

2009 World Championships (in London – no team)

Americans Bridget Sloan placed 1st in AA, Rebecca Bross placed 2nd in AA, 3rd in UB and BB. Kayla Williams placed 1st in V. Ivana Hong placed 3rd in BB. Timothy McNeill placed the highest in AA among the U.S. men at 7th place, also placing 5th in PH.

The American HB finalists were Danell Leyva who placed 4th, and Jonathan Horton who placed 8th, and FE finalist Steven Legendre placed 8th.

U.S. Olympic and World Championships medalist places from 1932 (Wikipedia; Amateur Athletic Union Gymnastics Handbook, 1943)

1932 OG – 2nd place men's team, 1st R, HB, IC & RC (4 gold medals).
1948 OG – 3rd place women's team, 2nd place in women's V (but medal were awarded to women)
1976 OG – 3rd place in FE (men).
1979 WC – 3rd place men, 7 individual medals (men).
1981 WC – 3rd place in UB and BB (women).

1984 OG – 1st place men's team, 1st PH & PB; 2nd AA & V; 3rd PH, R & PB (7 individual, including 2 gold, medals).
1984 OG – 2nd place women's team. 1st, AA, UB; 2nd FE, V; 3rd UB, BB & FE, (6 individual, including 2 gold, medals).
1991 WC – 2nd place women's team; 1st AA; 2nd UB; 3rd BB & FE.
1992 WC – 1st BB, FE; 2nd UB (women).
1992 OG – 3rd place women's team; 2nd AA & BB; 3rd UB & FE (4 women's individual medals). Men, 1st HB.
1993 WC – Women, 1st AA, UB & FE; 2nd UB & BB.
1994 WC – 3rd place women's team, 1st AA & BB; men 2nd R.
1995 WC – 3rd place women's team; 2nd BB.
1996 WC – 3rd BB.
1996 OG – 1st place women's team. 1st BB; 2nd UB; 3rd FE.
2001 WC – 2nd place men's team; 1st PB.
2001 WC – 3rd place women's team.
2003 WC – 1st place women's team, 1st UB, 2nd AA.
2003 WC - 2nd place men's team, 1st AA & FE.
2004 OG – 2nd place men's team; 1st AA, 2nd HB. 2nd place women's team; 1st AA, 2nd V, UB & BB.
2005 WC – 1st & 2nd AA (women), UB, BB, & FE, and 3rd Vault. (4 gold and 9 total medals).
2006 WC – 2nd place women's team; 2nd AA, V, UB & FE. Men: 3rd PH.
2007 WC – 1st place women's team; 1st AA, FE & BB; 2nd UB & FE; 3rd V.
4th place men's team, and 4th place in AA, FE & R.
2008 OG – 2nd place women's team, 1st & 2nd AA (women), 1st & 2nd on BB; 2nd UB; 2nd & 3rd in FE.
3rd place men's team, and 2nd on HB.
2009 WC – 1st & 2nd AA (women), 1st V; 3rd UB & BB.

U.S. Team Medals in OG and WC		Total
Women:	1st place – 1996, 2003, 2007	(3)
	2nd place – 1984, 1991, 2004, 2006, 2008	(5)
	3rd place – 1948, 1992, 1994, 1995, 1996, 2001	(6)
Men:	1st place – 1984	(1)
	2nd place – 1932, 2001, 2003, 2004, 2006	(5)
	3rd place – 1979, 2008	(2)

U. S. Women's All-Around dominance (since 1984)
1st place: 1984, 1991, 1993, 1994, 2004, 2005, 2007, 2008, 2009 (8 different women)
2nd place: ……….............. 1992, 2003, 2005, 2006, 2008, 2009 (plus 2 other women)

U.S. Team Medals in the PAG
Women: 1st place - 1959, 1963, 1967, 1971, 1975, 1983, 1987, 1991, 1995, 2003, 2007 (11 total)
2nd place - 1999

Men: 1st place – 1955, 1959, 1963, 1967, 1975, 1987, 1995 (7 total)
2nd place – 1971, 1983, 1999
3rd place – 2003, 2007

It took many years for the United States to establish itself as one of the world leader in artistic gymnastics. After the 1932 Olympic Games, which were sparsely attended, the U.S. men gymnasts did not win another Olympic team medal, which was gold, until 1984 or 52 years later; although they did win the bronze medal 47 years (after 1932) in the 1979 World Championships. The U.S. women gymnasts, who first competed in 1936 Olympic Games, won their first team medal in the 1948 Olympic Games. It took another 48 years before they would win their next team medal which was gold in the 1996 Olympic Games. Although the U.S. men gymnasts had a reputation of being innovative after World War II, they were looked down upon by a number of the European countries. The writer experienced firsthand that male Swiss gymnasts and Finnish gymnasts being insulted when the U.S. team first beat their teams (in Europe). Over the last decade or two the U.S. gymnasts have earned the respect of the world. The results speak for themselves.

REFERENCES*

Metzner, H. (1989). *History of the American Turners*, 4th edition.

Old caricature drawing in the archives of the New York Turnverein now at, Stroudsburg, PA.

Moore, R.E. (1941). History of Gymnastics in the United States. In *Amateur Athletic Union of the United States Gymnastics Handbook, 1940-41*, p. 5-9. National Headquarters, 3002-3, Broadway, New York.

Wright, J. (2005). *Gymnastics Who's Who*.

Maloney, T. (1953). *Report on the 1952 Olympic Games.* Amateur Athletic Union of the United States Gymnastics Yearbook.

Wikipedia. From: www.en.wikipedia.org/wiki/sokol

Gymnastics Media Guides from the listed universities.

Foster, W. K. (1950). *A History of Gymnastics at the University of Minnesota, 1898-1950.*

Frederick, A.B. (2009). *Roots of American Gymnastics,* 3rd Ed, p. 87.

Metzner, H. (1911). *A Brief History of the North American Gymnastics Union.* Indianapolis.

Personal accounts.

NCAA women's gymnastics programs. From: www.usgyms.net/ncaa_programs.htm

Copp, B. *Two Centuries of Trampoline*. Video.

Amateur Athletic Union Gymnastics Handbook 1943.

Amateur Athletic Union Guide and Handbook 1960.

Mallon, B. (1999). *The 1904 Olympic Games*, McFarland & Company, Inc., Publishers.

Cumiskey, F. (1984). History of Gymnastics. *International Gymnast issues (July 1983 to April 1984).*

Wallechinsky, D. (2004). *The Complete Book of the Summer Games*. Edition, p. 809-874. From: www.sportclassicbooks.com

Mallon, B. & Bijkerk, A. (2003). *The 1920 Olympic Games*, McFarland & Company, Inc., Publishers.

Official Report (1933). *The Games of the Xth Olympiad Los Angeles 1932.* p. 657-670.

Amateur Athletic Union Official Gymnastics Yearbook 1948.

Amateur Athletic Union Official Gymnastics Yearbook 1951.

Amateur Athletic Union Official Gymnastics Yearbook 1952.

United States 1952 Olympic Book

Quadrennial Report. (1952) Bushnell, A. (Ed.).

Amateur Athletic Union Official Gymnastics Yearbook, 1956.

Amateur Athletic Union Official Gymnastics Yearbook 1957.

Amateur Athletic Union Official 1965-1966 Gymnastics Guide and Handbook

Holmes, H. *Private DVD of Hal Holmes' tumbling career.*

Amateur Athletic Union Official Gymnastics Yearbook 1953.

Viewed on movie films or youtube.

*Note: for further information about references please contact author directly.

QUALITY OF THE TEACHING PROCESS AS AN EXPLANATORY VARIABLE IN LEARNING GYMNASTICS SKILLS IN SCHOOL PHYSICAL EDUCATION

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Original research article

Abstract

The aim of the study was to seek explanatory factors for learning gymnastics skills in school physical education. One hundred four 7- to 16-year-old students from 19 teaching groups and 23 teachers participated in measurements over 3 years of follow-up. A group of tests measured the skills in apparatus gymnastics and motor abilities. Videotapes were used to observe the teaching events. The focuses for observation were divided between the factors for input, process, and feedback. Factor analysis, regression analysis, and automatic interaction detector (AID) analysis were used in data processing. In the explanatory model for the factors in a teaching event, most explanation was on the quality of practice to improve gymnastics skills. It was possible to compensate for qualitatively weak feedback in teaching with a good transfer effect, and to compensate for a weak transfer effect with good feedback. The competence of the teacher can be emphasized significantly through, for example, the scholastic management of physical education and pupil awareness. This combination guarantees the individuality and continuity of teaching.

Keywords: *gymnastics, physical education, skills, teaching, quality.*

INTRODUCTION

The development of the motor ability and sports skills of pupils has been considered important in the physical education (PE) curriculum. The importance of different forms of sports has been emphasized for pursuing life-long physical activity and for the versatile development of fitness and motor abilities. Examining teacher and student behavior during physical education lessons means the evaluation of school physical education and teacher training. In research into school physical education, the process of teaching and its results are generally examined independently of one another. A qualitative assessment of the factors in teaching provides knowledge about the nature of physical education. Through process-product research, the explanatory factors for learning skills can be sought.

Physical education effectiveness research is mostly based on a process-product setting where relationships between teacher behavior and student achievement and the efficacy of different teaching methods are studied. The tasks in effectiveness studies have generally been skills in different sports. The length of the teaching unit and the number of lessons have been the function of the relative ease or difficulty of learning a task. The total teaching time of the lessons has varied from a single 15-minute lesson (Yerg and Twardy, 1982) to 15 hours of instruction over a series of lessons (De Knop, 1983).

The entry level has been one of the most important variables in studies with short-term duration. In Yerg's (1977, 1981a) studies, 75% of the total variance of the final level of achievement in the task was explained by the entry level of the performance. The variance was lower in other studies: 46% in Piéron and Piron's (1981) study and 31% in Yerg and Twardy's (1982) study. In long-term studies, the importance of the entry level is less significant. De Knop (1983) found in a 15-hour follow-up that the amount of entry level skill explained by the final performance varied according to different aspects of the performance: 17% for the skill test, 18% for motivation, and 56% for the technique. At least a small amount of the connection between the entry level and skill improvement can be explained by the findings according to which high-skilled students spend more time on-task than moderate or low-skilled students (Graham, 1987a; Grant, Ballardt, and Glynn, 1989; Landin, 1995; Shute, Dodds, Placek, Rife, and Silverman, 1982; Telama, Varstala, Heikinaro Johansson, and Utriainen, 1987).

Most effectiveness studies have corroborated the importance of the time spent practicing the criterion task or the number of practice trials. De Knop's study (1983) found the time allocated for practice to be related to teacher effectiveness. In other studies (e.g. Piéron and Piron, 1981; Metzler, 1983; Phillips and Carlisle, 1983), this connection has not been replicated. Just being in class longer does not guarantee greater achievement. What students actually do during a lesson is more important (Da Costa and Piéron, 1992; Piéron and Piron, 1981; Yerg, 1977, 1981a). Phillips and Carlisle (1983) reported that teachers in the more effective group provided their students with more than twice the amount of engaged skill learning time than the less effective teachers.

In Yerg's (1977) study, the influence of practice was greater than the teachers' knowledge or personal skill of the subject matter. On the other hand, practice without feedback is not necessarily effective. In Yerg and Twardy's (1982) study, practice negatively influenced the pupils' outcome in lessons where teachers remained passive observers.

The amount of time students spend practicing at an appropriate or successful level is positively related to student achievement, and inappropriate or unsuccessful practice is negatively related to achievement (Ashy, Lee, and Landin, 1988; Buck, Harrison, and Bryce, 1990; Dugas, 1984; Piéron, 1983; Silverman, 1985a, 1990, 1993). The quality of the student engagement is more important than total practice (Ashy et al., 1988; Silverman, 1990; Solmon, 1992). Compared with the low learning group, the high learning group demonstrated a higher success rate for specific students (Piéron, 1983). Phillips and Carlisle (1983) observed that success during engaged skill learning was also found more often in the classes of more effective teachers.

Several studies have considered the clarity of teachers' presentation along with the amount of time teachers spend actually instructing a class as variables. Werner and Rink (1989) found, however, that inaccurate and global teacher statements do not aid learning. Graham (1987b) and Piéron and Graham (1988) demanded that research efforts in this area need to focus more on the variables closely related to the quality of the teacher's presentation, rather than on simple measures of time. Variables such as clarity, appropriate instruction, and the use of demonstration may lead to a better understanding of the function of a teacher's instruction in enhancing student learning. Masser (1993) found that biomechanically correct instruction consisting of words that related to body parts and were a part of a young learner's vocabulary promoted learning motor skills and helped in maintaining that improvement over a period of several months. Gusthard, Kelly, and Rink (1997) have found qualitative measures in teacher clarity and task presentation valid as process estimates of student achievement. Divergent results have been reported concerning the relationships between teacher feedback and learning outcomes. Studies that have shown a connection between teacher feedback and student achievement have not proved feedback to be a major predictor of achievement (Eghan, 1988; Silverman, Tyson, and Krampitz, 1992). Yerg (1983) observed that the direction of feedback was relevant to skill improvement. Feedback for a single student referring to total movement was positively related to student achievement, and on the other hand, detailed informative feedback was negatively related to the student outcome on the same criterion.

Several studies have shown a facilitating role for teacher feedback. When students are learning a beginning balance skill, teacher feedback was found to positively influence student learning (Yerg and Twardy, 1982). The positive feedback was higher for more effective teachers in the volleyball unit (Phillips and Carlisle, 1983). In the study of tennis teachers, feedback accounted for 11% to 16% of the total variance of the final level in accuracy or skill and technique measures (De Knop, 1983).

Pellet and Harrison (1995) pointed out that feedback effects are limited if the difficulty of the task does not match the performance capabilities of the learners. According to Rink (1993, 1996), feedback is useful in adjusting the appropriateness of a task to a learner. This strategy is very useful for large group instruction. Da Costa and Piéron (1992) stated that the accuracy, faultlessness, and appropriateness of teacher task presentation and feedback were characteristic of the most effective teachers. Proficiency in the subject taught combined with the communication skills needed is the best guarantee for success in teaching.

In future research, concentrating on the quality of student practice could give important knowledge about skill learning. The role of a teacher should be to facilitate learning: developing a positive learning environment, creating more powerful learning relationships among teachers and students, and maintaining the cognitive processes of students at a high level are actions that improve learning (Lambert, 1996; Rink, 1996).

The purpose of this study was to determine the quality of the elements in a teaching event and seek the explanatory factors for learning skills in physical education lessons. The main ideas were a long follow-up time and the wide inspection of the concept of a teaching event. The motor skills studied were basic skills in apparatus gymnastics.

METHOD

Setting and Participants

The research was carried out as a 3-year follow-up in connection with the Intensive Physical Education Research Project (Nupponen, Halonen, Mäkinen, and Pehkonen, 1991).

A multiphase and nonprobability sampling were used to select participants. The schools were selected from six municipalities in Lapland participating in the Intensive PE Research Project, including five primary and three secondary schools from rural areas and cities. In the 1st year of follow-up, all the students in the first, third, fourth, and seventh grades in the respective schools participated in the measurement of gymnastics skills and motor abilities. The number of students participating in all six measurements during the 3-year follow-up was 280 (132 girls and 148 boys). In 3 years, a 23% subject attrition was observed. There was no difference between the attrition group and the other subjects in the pretest of gymnastics skills.

The analysis of the teaching event for apparatus gymnastics was based on the respective lessons given at the participating schools. The lessons took place in the school gyms, and the teachers were asked to give the lessons according to the school curriculum, as the teachers would normally. Both teacher's and student's actions were observed during gymnastics lessons in 5-minute periods. Recordings were made with a video camera and a cordless microphone for the teacher. The observed students were selected randomly from the student list of the teaching group. During the 2nd and 3rd years of follow-up, the same students were observed as during the 1st year. Within the 3-year follow-up, each student had an average of 3.3 5-minute periods (variation from 1 to 8) in the data. The entire material consisted of 343 5-minute periods. Because of the big variation in the number of observation periods per student, the periods were assigned to represent cases, while the test scores of motor ability and gymnastics skills were entered under these periods. The complete matrix included 268 periods. The number of students included in the material was 104 (47 girls and 57 boys). During the 1st year of follow-up, the study included 19 teaching groups. During the 3 years, 23 teachers (12 female and 11 male) participated in the study. The number of PE classes was 78.

Tests and Data Collection

A group of tests that included four basic movement patterns measured the skills in apparatus gymnastics. These movements were body bending and stretching, rotating, jumping, and balancing. The test movements were underswing shoot dismount, hip circle, roll, cartwheel, support vault, and handstand. The level of the achievement in gymnastics skills was evaluated on a scale of 0 to 5. The scale describes the stages of learning (Fitts, 1964; Fitts and Posner, 1969) where 0 means an *unsuccessful trial*, 1–2 represents *the cognitive phrase of learning*, 3–4 *the associative phrase of learning*, and 5 *the autonomous phase of learning*. The skills were measured when the motor abilities were measured in which the focuses were muscle strength, flexibility, balance, and motor control. The tasks were standing 5-jump (it was used to measure explosiveness of leg extensor muscles in horizontal direction), flexed arm hang (for measuring relative strength and upper body muscular endurance), 30 second sit-ups (measures the strength and endurance of the abdominals and hip-flexor muscles), forward trunk flexion (measures the flexibility of the hamstring and lower back muscles), sidewards jumping (for measuring movement speed in lower extremities), one leg static balance (has been used to assess postural stability), figure-8 ball dribbling (measuring the ball handling and eye-hand and eye foot coordination), and target throwing (measuring the over arm throwing accuracy and spatial ability). The body build measurements were for height and weight.

The variables were standardized for comparison. To enable a comparison of time and gender, standardization was carried out over the entire measurement time to all the materials. The conversion factors for motor ability created by Nupponen (1997) were also used in this material. Variables for development were the differences between the pretests and the posttests. Body build was described using the body mass index (BMI).

The focuses for observation of the teaching event were divided between the factors for input, process, and feedback. There were four dimensions for observation for each of the three areas. The factors for input were observed in the instructions given by the teacher, the organization, the progress of skills, and the appropriateness of the tasks during teaching. The process factors observed were the perceptual behavior of the student, the quality of practice in skills, and the activities of the teacher in support of the short- and long-term memory of the student. For feedback, the factors consisted of the clarification of the quality of *corrective and* reinforcing feedback, the activation of the internalized feedback system, and the continuity of feedback.

The student was the focus of observation. The teacher's activities were evaluated on a scale of -1, 0, +1, where -1 refers to *preventive or detrimental behavior*, 0 is *neutral*, and +1 refers to *events that promote learning*. The measurements of the quality were completed by measuring the time-on-task for each student observed. The evaluation was made by the researcher who had over 20 years experience in teacher training.

Data Analysis

Factor analysis with the principal axis method and oblique rotation was used to reduce the number of observed variables. A four-factor solution was selected for interpretation. The factors were named Practice, Teaching, Feedback, and Transfer. Models for causal relationships, nonlinear connections, and interactions were described using automatic interaction detector (AID) analysis (e.g., Sonquist, Baker, and Morgan, 1971). In the first model, the dependent variable was the change in gymnastics skills in the 3 years described by the pretest and posttest differences. The independent variables were student gender, school level, motor abilities, body build, and the factors of the teaching event. In the second model, the dependent variable was a residual variable, which was formed with stepwise regression analysis. In this analysis, the proportion of body build and motor ability was cut off from the change in gymnastics skills. The independent variables in the second model were student gender, school level, and the factors of the teaching event.

Parallel observation measured the reliability of the assessment of gymnastics skills. The correlations between the scores of two observers varied from .72 in cartwheels to .96 in hip circles. The stability of test scores during the 3 years was examined with a simplex model of the LISREL method. The constancy coefficients of the summation variables of gymnastics skills varied from .87 to .93. The goodness of fit for gymnastics skills was .985. The results were the same for boys and girls.

Video observation measured the observation reliability of the quality of the teaching event. The congruence percentages between two independent observers were counted with parallel tests in 20 5-minute periods. Retesting with a 2-week time interval was used to define the stability of observation. The congruence percentages in parallel testing varied between 50% and 90%. In the retesting, the percentages ranged from 65% to 100%. The lowest percentages were observed in the variable on the quality of practice and the highest in the variable on corrective feedback. Reliability was also examined at the level of factorial summation variables, in which reliability was counted with intercorrelations of two measurements. In parallel testing, the correlation in the variable practice was below .50. The other correlations can be considered satisfactory (Table 1).

Table 1. *The Parallel and Retest Reliability of Quality Variables in Teaching Event, Factorial Summation Variables (N = 20).*

Variable	Parallel test	Retest
Practice	.47	.64
Teaching	.79	.79
Feedback	.54	.88
Transfer	.58	.64

RESULTS

In the first explanatory model for gymnastics skills, the clearest connections to the development of gymnastics skills were obtained for body build, muscle condition, and flexibility. There were no explanatory factors for the teaching event in this model (Table 2).

According to the AID tree, it is possible to compensate with good motor abilities for the problems in the development of gymnastics skills that result from being overweight. The best improvement in skills was achieved by a group composed of primary school pupils whose entry level in gymnastics skills was weak or average and whose body mass index was low or average.

Table 2. *β5-Coefficients and Percentage of Explained Variance in AID Analysis, Dependent Variable: Improvement in Gymnastics Skills in 3-Year Period (First Model).*

Predictor	β5
BMI	.186
Muscle condition	.082
Flexibility	.078
Motor control	.047
Entry level in gymnastics	.059
School level	.075
Percentage of the explained variance	52.7%

In the second model, the percentage of the explained variance for the change in the residual variable for improvement in gymnastics skills remained at 18.3%. The number of significant (percentage of explanation more than 1%) predictors was five (Table 3). The quality of practice had the highest explanatory power to improve gymnastics skills. This variable included the quality of student practice trials and the appropriateness of the task. The factor Teaching, consisting of instruction, organization, progress, short-term memory, and perceptual behavior variables, had no explanatory power in the model.

Table 3. *β5-Coefficients and Percentage of Explained Variance in AID Analysis, Dependent Variable: Residual of Improvement in Gymnastics Skills in 3-Year Period (Second Model)*

Predictor	β5
Practice	.094
Feedback	.035
Transfer	.032
Student gender	.015
School level	.007
Percentage of the explained variance	18.3%

The tree-figure was created for a closer inspection of the causal relationships. The five predictors of the model divided the data nine times. The most important predictor for the improvement in gymnastics skills was Practice, which divided the data twice. In the subgroups, the division was made with Feedback and Transfer. The inspection of the extreme groups showed that the greatest improvement in gymnastics skills was achieved by a group with qualitatively good practice and receiving good or poor feedback. The weakest group consisted of primary school boys with low quality of practice. Qualitatively poor practice was a greater detriment for boys than for girls, and it was a more common problem for boys in secondary school than it was in primary school. Feedback and Transfer had an interesting interaction in the explanation for improvement in gymnastics skills. It was possible to compensate for qualitatively weak feedback in teaching with a good transfer effect and to compensate for a weak transfer effect with good feedback.

In some subgroups (students with qualitatively good practice and primary school boys with poor practice), feedback had a nonlinear connection to the improvement in gymnastics skills. Qualitatively moderate feedback meant lesser improvement in skills than good and poor feedback.

DISCUSSION

The connections of the qualitative variables of teaching to the improvement of the skill level in apparatus gymnastics indicated the optimal level of difficulty and the quality of practice for a task as having the strongest explanation for progress in skills. These qualitative variables also correlated strongly among themselves and formed the dimension of Practice, named in factor analysis. For students, the time used for practice in appropriate tasks has been proved positive for the development of skills, while the time used for tasks that are too easy or too difficult is negative in relation to development (Ashy et al., 1988; Buck et al., 1991; Dugas, 1984; Piéron, 1983; Silverman, 1985b, 1990; Silverman, Kulinna, and Crull, 1995).

The time spent on practicing motor skills has proved to be an important explanatory factor in motor skill development (Da Costa and Piéron, 1992; Piéron and Piron, 1981; Yerg 1977, 1981a). A teacher's expertise in subject matter has been proved to be in teaching so that a teacher with good expertise provides more tasks for the students and adjusts the difficulty level suitable for students' abilities (Hastie and Vlaisavljevic, 1999; Rink, 1993; Schempp, Manross, Tan, and Fincher, 1998). The movement tasks, which are suitable for the abilities, represent movement responses with good quality, and the quality of the performances is more important for the progress of skills than the quantity (Ashy et al., 1988; Silverman, 1990; Solmon, 1995).

The connections between feedback and the progress of skills have been parallel to the connections between practice and development. There is a big difference in the amount of feedback between a teacher and a student in a PE class. The teacher provides feedback on average 60% of the time during a gymnastics class, but a student receives feedback 1% of the time of a lesson. The aim of the feedback is to affect the development of skills. Feedback is positive for the level of skill of a student, when feedback is aimed at the overall structure of the movement. Feedback aimed at details of the movement negatively affects the skills (Yerg, 1983). The qualitative assessment of teacher's instructions is an adequate predictor in student skill learning (Gusthard et al., 1997).

Although the quality of practice was more clearly related to the development of gymnastics skills in this study, it must be remembered that, without quantity, there can be no quality. This can best be seen through the so-called funneling effect: the time used for the active practice of skills multiplies when attention is paid to the number of lessons for gymnastics in the curriculum, the amount of gymnastics offered during a lesson, and the activity of the students.

The first explanatory model for apparatus gymnastics strengthened the links between the structure of body and motor abilities and the development of gymnastics skills. The body mass index, muscle condition, and flexibility explained more than 30% of the variation in the improvement of the skills in apparatus gymnastics. The AID analysis tree revealed that overweight students in gymnastics lessons were a problem group. Comparable results have been obtained in earlier cross-section research (e.g., Holopainen, 1990; Pehkonen, 1984). Cross-referencing on the AID tree revealed that good flexibility and motor control improved the situation of overweight students.

The dimension for a teaching event, which includes the factors for input (giving instructions, teaching arrangements), did not prove to be an interpreter in the development of skills. Although previous studies about the significance of presenting a task partially conflict, studies (e.g., Graham et al., 1983; Phillips and Carlisle, 1983) that show giving instructions not to explain learning are more numerous than those showing such significance. Piéron and Graham (1988) have called for concentration on teaching variables for assessing quality instead of quantity. Probably, the factors in teaching are a practice-like variable: there has to be quantity in order for quality to exist. In the issues related to giving instructions and the arrangements for teaching, the expert-novice setting could produce clearer results than the setting for this study.

The curvilinear link in the quality of feedback to the development of skills in some groups is an interesting phenomenon. Qualitatively good and poor feedback mean better development of skills than average feedback. This could arise from the scoring in the observation instrument: average feedback means the same as no feedback. Thus, strict professionalism in school physical education is not as important as the eagerness of the teacher. For the student, it is important that his or her effort is noticed and commented upon. The most important meaning for feedback in promoting learning lies in the fact that perceiving the students makes the quality of their practice more effective (Silverman et al., 1995). Expert feedback also often has the characteristic of finding mistakes, which may be better suited to sports training. The observations made in this study on the limited possibilities of students with weaker starting levels to receive information support these perceptions. Recent studies (Chiviakowsky and Wulf, 2002, 2005) have shown that learners prefer to receive feedback after they believe they had a good rather than poor trial. The results demonstrated that learning is facilitated if feedback is provided after good trials (Chiviakovwsky and Wulf, 2007).

The most important interpreter in motor skill learning is to provide tasks that are suitable for the abilities of the student. Providing these tasks demands two types of expertise from the teacher: subject mastery and acquaintance with the pupils are a strong combination. The precision, correctness, and appropriateness of the instruction and the feedback are characteristic of the most effective teachers. Subject expertise combined with the communication skills needed are the best guarantee of success in teaching (Da Costa and Piéron, 1992). The meaning of the feedback as an interpreter of learning disappears if the difficulty of the task does not match the abilities of a learner (Pellet and Harrison, 1995). With the help of feedback, the suitability of the task difficulty is also possible. Feedback that is directed to all students in the class has the greatest significance (Rink, 1993, 1996).

Providing optimal difficulty level tasks demands kinesiological mastery and sensibility in noticing the student's abilities. In the education of classroom teachers, there could be a cause for raising the level of biomechanical mastery of gymnastics and other sports. The teaching practice should be arranged in such a way that the student teacher can become acquainted with the pupils: the same class during several years of studies.

The interaction of feedback and transfer in developing skills brought different teaching strategies to light. With the help of the progress of teaching, the teacher who constructs skills based on earlier learning gets good results, even though feedback during teaching may be weak. This type of teaching probably suits very large groups in which individual feedback would otherwise be difficult. In small groups, in which the possibilities of giving feedback are better, the significance of the transfer effect is not as big as in large groups. The combination of a strong transfer effect and qualitatively good feedback is not effective in teaching skills perhaps because, in that case, teaching takes time from learning.

In physical education classes with a large number of students, the meaning of the learning environment is emphasized. Skill progression is possible with the help of different equipment. Places of performance with standard measurements in a competitive sport are seldom suitable for children. The role of a teacher should be a facilitator of the learning: developing a learning environment, creating relationships between the students and teachers, and keeping up the cognitive processes of students are actions that promote learning (Lambert, 1996; Rink, 1996). Treating the learning environment and skill progression most positively affect the development of skills of very young children and pupils with a weak starting level (Hebert, Landin, and Solmon, 2000; Sweeting and Rink, 1999).

Together with the physical environment, the development of the learning atmosphere is a task for a PE teacher. A feeling of safety diminishes the fears in skill-learning situations. Safety can be increased with the solutions, in which the student can choose tasks suitable for his or her abilities. The assistance and feedback provided by other students can also be seen as a means of a social education. In school physical education, the prevailing method of teaching is traditionally teacher-led. It consists of a chain: demonstrate, explain, provide practice, and correct mistakes. However, the results of learning skills refer to the significance of other types of approach. In this study, the constructive concept of learning gets abundant support. The most important interpreter of learning is to offer tasks that meet the ability of the student. The initiative of a student can be seen in his or her working through an offered task that emphasizes the conscious control of learning a skill. This does not mean that the teacher is unnecessary in the teaching process or that his or her professionalism has no meaning. The competence of the teacher can be emphasized significantly through, for example, the scholastic management of physical education and student awareness. This combination guarantees the individuality and continuity of teaching.

REFERENCES

Ashy, M., Lee, A. and Landin, D. (1988). Relationships of practice using correct technique to achievement in a motor skill. *Journal of Teaching in Physical Education, 7*, 115–120.

Buck, M., Harrison, J. and Bryce, G. (1991). An analysis of learning trials and their relationship to achievement in volleyball. *Journal of Teaching in Physical Education, 10*, 134–152.

Chiviakowsky, S. and Wulf, G. (2002). Self-controlled feedback: Does it enhance learning because performers get feedback when they need it? *Research Quarterly for Exercise and Sport, 73*, 408–415.

Chiviakowsky, S. and Wulf, G. (2005). Self-controlled feedback is effective if it is based on the learner’s performance. *Research Quarterly for Exercise and Sport, 76*, 42–48.

Chiviakowsky, S. and Wulf, G. (2007). Feedback after good trials enhances learning. *Research Quarterly for Exercise and Sport, 78*, 40–47.

Da Costa, F. and Piéron, M. (1992). Teaching effectiveness: Comparison of more and less effective teachers in an experimental teaching unit. In T. Williams, L. Almond, and A. Sparkes (Eds.), *Sport and physical activity* (pp. 169–176). London, England: E and FN Spon.

De Knop, P. (1983). Effectiveness of tennis teaching. In R. Telama, V. Varstala, J. Tiainen, L. Laakso, and T. Haajanen (Eds.), *Research in school physical education* (pp. 228–234). Jyväskylä, Finland: The Foundation for Promotion of Physical Culture and Health.

Dugas, D. (1984). Relationships among process and product variables in an experimental teaching unit. *Dissertation Abstracts International*, *44*, 2709A.

Eghan, T. (1988). *The relation of teacher feedback to student achievement in learning selected tennis skills*. Unpublished doctoral dissertation, Louisiana State University.

Fitts, P. M. (1964). Perceptual motor skill learning. In A. W. Melton (Ed.), *Categories of human learning* (pp. 243–285). New York, NY: Academic Press.

Fitts, P. M. and Posner, M. (1969). *Human performance*. Belmont, CA: Brooks Cole.

Graham, K. (1987a). A description of academic work and student performance during a middle school volleyball unit. *Journal of Teaching in Physical Education*, *7*, 22–37.

Graham, K. (1987b). Motor skill acquisition - An essential goal of physical education programs. *Journal of Physical Education, Recreation and Dance*, *58*(7), 44–48.

Graham, G., Soares, P. and Harrington, W. (1983). Experienced teachers' effectiveness with intact classes: An ETU study. *Journal of Teaching in Physical Education*, *2*, 3–14.

Grant, B., Ballardt, K. and Glynn, T. (1989). Student behaviour in physical education lessons: A comparison among student achievement groups. *Journal of Educational Research*, *82*, 216–226.

Gusthart, J. L., Kelly, I. M. and Rink, J. E. (1997). The validity of qualitative measures of teaching performance scale as a measure of teacher effectiveness. *Journal of Teaching in Physical Education*, *16*, 196–210.

Hastie, P. A. and Vlaisavljevic, N. (1999). The relationship between subject-matter expertise and accountability in instructional tasks. *Journal of Teaching in Physical Education, 19*, 22–33.

Hebert, E. P., Landin, D. and Solmon, M. A. (2000). The impact of task progressions on students' practice quality and task-related thoughts. *Journal of Teaching in Physical Education*, *19*, 338–354.

Holopainen, S. (1990). *Koululaisten liikuntataidot: Motorisen taitavuuden kehittyminen kehon rakenteen, kehitysiän ja liikuntaharrastusten selittämänä ja taitavuuden pedagoginen merkitys* [Motor skills of schoolchildren: The development of motor skill and its association with somatotype, biological age, interests in sport, and self-concept]. *Studies in Sport, Physical Education and Health 26*. Jyväskylä, Finland: University of Jyväskylä.

Lambert, L. (1996). Goals and outcomes. In S. J. Silverman and C. D. Ennis (Eds.), *Student learning in physical education* (pp. 149–169). Champaign, IL: Human Kinetics.

Landin, D. (1995). Task difficulty and the concept of progression. *Research Quarterly for Exercise and Sport*, *66*(Suppl. 1), 58.

Masser, L. S. (1993). Critical cues help first-grade students' achievement in handstands and forward rolls. *Journal of Teaching in Physical Education*, *12,* 301–312.

Metzler, M. (1983). Using academic learning time in process-product studies with experimental teaching units. In T. Templin and J. Olson (Eds.), *Teaching in physical education* (pp. 185–196). Champaign, IL: Human Kinetics.

Nupponen, H. (1997). *9-16 -vuotiaiden liikunnallinen kehittyminen* [Development of motor abilities and physical activity in school children aged 9-16]. *Research Reports on Sport and Health 106*. Jyväskylä, Finland: LIKES-Research Center for Sport and Health Sciences.

Nupponen, H., Halonen, L., Mäkinen, H. and Pehkonen, M. (1991). *Tehostetun koululiikunnan tutkimus: Peruskoulun oppilaiden liikunnalliset, tiedolliset ja sosiaaliset toiminnat kolmen lukuvuoden aikana* [Research on increased efficiency in physical education in schools; Physical, intellectual, and social activities in comprehensive school children during a three-year period] *(Turun yliopisto: Kasvatustieteiden tiedekunnan julkaisusarja A: 146)*. Rauma, Finland: University of Turku, Department of Teacher Training in Rauma.

Pehkonen, M. (1984). Telinevoimistelu kunnon ja taitavuuden kehittäjänä [Meaning of apparatus gymnastics in promoting fitness and motor abilities]. *Liikuntakasvatus*, *49*(3), 38–43.

Pellet, T. L. and Harrison, J. M. (1995). The influence of a teacher's specific, congruent, and corrective feedback on female junior high school students' immediate volleyball practice success. *Journal of Teaching in Physical Education*, *15,* 53–63.

Phillips, D. and Carlisle, C. (1983). A comparison of physical education teachers categorized as most and least effective. *Journal of Teaching in Physical Education*, *2*, 55–67.

Piéron, M. (1983). Effectiveness of teaching a psychomotor task (gymnastic routine). Study in a class setting. In R. Telama, V. Varstala, J. Tiainen, L. Laakso, and T. Haajanen (Eds.), *Research in school physical education* (pp. 222–227). Jyväskylä, Finland: Foundation for Promotion of Physical Culture and Health.

Piéron, M. and Graham, G. (1988). Research on teacher effectiveness experimental teaching units. In M. Piéron and J. Cheffers (Eds.), *Research in sport pedagogy. Empirical analytical perspective* (pp. 131–145). Schorndorf, Germany: Hofmann.

Piéron, M. and Piron, J. (1981). Recherche de critères d'efficacité de l'en seignement d'habilités motrices. *Sport*, *24*, 144–161.

Rink, J. E. (1993). *Teaching physical education for learning*. St. Louis, MO: Mosby.

Rink, J. E. (1996). Effective instruction in physical education. In S. J. Silverman and C. D. Ennis (Eds.), *Student learning in physical education* (pp. 171–198). Champaign, IL: Human Kinetics.

Schempp, P. G., Manross, D., Tan, S. K. and Fincher, M.D. (1998). Subject expertise and teachers' knowledge. *Journal of Teaching in Physical Education, 17*, 342–356.

Shute, S., Dodds, P., Placek, J., Rife, F. and Silverman, S. (1982). Academic learning time in elementary movement education: A descriptive-analytic study. *Journal of Teaching in Physical Education*, *1*, 3–14.

Silverman, S. (1983). The student as the unit of analysis: Effect on descriptive data and process-outcome relationships in physical education. In T. Templin and J. Olson (Eds.), *Teaching in physical education* (pp. 277–285). Champaign, IL: Human Kinetics.

Silverman, S. (1985a). Student characteristics mediating engagement-outcome relationships in physical education. *Research Quarterly for Exercise and Sport*, *56*, 66–72.

Silverman, S. (1985b). Relationship of engagement and practice trials to student achievement. *Journal of Teaching in Physical Education*, *5*, 13–21.

Silverman, S. (1990). Linear and curvilinear relationships between student practice and achievement in physical education. *Teaching and Teacher Education*, *6*, 305–314.

Silverman, S. (1993). Student characteristics, practice and achievement in physical education. *Journal of Educational Research*, *87*(1), 54–61.

Silverman, S., Kulinna, P. H. and Crull, G. (1995). Skill-related task structures, explicitness, and accountability: Relationships with student achievement. *Research Quarterly for Exercise and Sport*, *66*, 32–40.

Silverman, S., Tyson, L. and Krampitz, J. (1992). Teacher feedback and achievement in physical education: Interaction with student practice. *Teaching and Teacher Education*, *8*, 333–344.

Solmon, M. (1995). The relationship between practice and achievement: Quantity, quality and student cognition. *Research Quarterly for Exercise and Sport*, *66*(Suppl. 1), 57.

Sonquist, J. A., Baker, E. L. and Morgan, J. N. (1971). *Searching for structure. Successor to the Automatic Interaction Detector Program*. Ann Arbor: University of Michigan, Institute for Social Research.

Sweeting, T. and Rink, J. E. (1999). Effects of direct instruction and environmentally designed instruction on the process and product characteristics of a fundamental skill. *Journal of Teaching in Physical Education, 18*, 216–233.

Telama, R., Varstala, V., Heikinaro-Johansson, P. and Utriainen, J. (1987). Learning behavior in PE lessons and physical and psychological responses to PE in high-skill and low-skill pupils. In G. Barrette, R. Feingold, C. Rees, and M. Piéron (Eds.), *Myths, models and methods in sport pedagogy* (pp. 239–248). Champaign, IL: Human Kinetics.

Werner, P. and Rink, J. (1989). Case studies of teacher effectiveness in second grade physical education. *Journal of Teaching in Physical Education*, *8*, 280–297.

Yerg, B. (1977). *Relationships between teacher behaviors and pupil achievement in the psychomotor domain*. Unpublished doctoral dissertation, University of Pittsburgh.

Yerg, B. (1981a). The impact of selected presage and process behaviors on the refinement of a motor skill. *Journal of Teaching in Physical Education*, *1,* 38–46.

Yerg, B. (1981b). Reflections on the use of the RTE model in physical education. *Research Quarterly for Exercise and Sport*, *52*, 38–47.

Yerg, B. (1983). Re-examining the process - product paradigm for research on teaching effectiveness in physical education. In T. Templin and J. Olson (Eds.), *Teaching in physical education* (pp. 310–317). Champaign, IL: Human Kinetics.

Yerg, B. and Twardy, B. (1982). Relationship of specified instructional teacher behaviors to pupil gain on a motor skill task. In M. Piéron and J. Cheffers (Eds.), *Studying the teaching in physical education* (pp. 61–68). Liège, Belgium: AIESEP.

COORDINATION OF HANDWALKING IN GYMNASTS: A COMPARISON TO BIPEDAL WALKING

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Original research article

Abstract

Handwalking is a skilled movement that many, if not most, individuals never master. However, mastery of handwalking is critical to successfully compete in gymnastics. Understanding the patterns of movement employed to achieve handwalking may provide insights into the coordination of handwalking and strategies that may be effective for improving handwalking performance. The aim of this study was to characterize the spatiotemporal features of handwalking in gymnasts, compare these features to those of typical walking, and determine how these features vary as a function of skill level. Nineteen gymnasts performed handwalking and bipedal walking trials on a computerized walkway. Participants used nearly identical cadences for handwalking and bipedal walking. Differences between handwalking and bipedal walking included shorter strides, a wider base of support, and more time spent in double support during handwalking. The increase in double support time may be a strategy adopted to enhance stability, as level of gymnastics skill was positively correlated with the amount of time spent in double support, i.e. with both hands in contact with the ground, during handwalking. Coaching strategies that encourage increasing the amount of time spent with both hands in contact with the floor may be advisable to improve handwalking performance.

Keywords: *coordination, gymnastics, handwalking, locomotion.*

INTRODUCTION

Handwalking is a form of skilled movement that many, if not most, individuals never master. However, many gymnasts do master this skill and perform it successfully on a regular basis. Understanding the patterns of movement employed to achieve handwalking may provide insights into the coordination of handwalking and strategies that may be effective for improving handwalking performance. No studies to date have examined handwalking performance, but a few studies have examined postural control during maintenance of a handstand (Kerwin and Trewartha, 2001, Gautier, Thouvarecq, and Chollet, 2007). The handstand has been characterized as an upright stance requiring precise coordination of multiple joint segments and utilizing vestibular, proprioceptive and visual feedback, similar to bipedal standing posture (Gautier, Thouvarecq, and Chollet, 2007). Furthermore, the displacements of center of pressure and body segment angles between three articular levels (shoulder, elbow, and wrist) have been found to reflect traditional erect posture (Kerwin and Trewartha, 2001). It has been suggested that similar control mechanisms may regulate maintenance of upright posture on the hands or the feet (Gautier, Thouvarecq, and Chollet, 2007). The aim of this study was to characterize handwalking patterns in gymnasts, compare these patterns to those of bipedal walking, and determine how patterns differ as a function of skill level.

METHODS

Participants

Nineteen gymnasts (18 female and 1 male, average age =16.9 +/- 5.7 years, age range = 7-25 years) participated in this study. Skill levels ranged from Junior Olympic competitive level 5 through collegiate level gymnastics. Inclusion criteria included the ability to maintain a straight body handstand with no assistance and to handwalk for at least 15 feet in that position with no assistance. Leg length was obtained by measuring the distance from the greater trochanter to the floor, and arm length was obtained by measuring the distance from the acromion to the floor (in the handwalking position). Written informed consent for minor subjects was obtained from guardians, while adult participants provided their own written informed consent. The protocol was approved by the Human Research Protection Office of the Washington University School of Medicine and was carried out according to the Declaration of Helsinki.

Procedures

Each participant completed three trials each of bipedal walking and handwalking. All walks were captured using a 4.8m GAITRite computerized walkway (CIR Systems, Inc., Havertown, PA). Order of the tasks was randomized, with the 3 trials of each task performed in a block. The primary variables of interest were velocity, stride length, cadence, width of the base of support (BOS), and percent of the gait cycle spent in stance and double support (i.e. with both hands or both feet in contact with the floor). In addition, velocity and stride length were normalized to arm and leg lengths of each participant for handwalking and bipedal walking, respectively. We also assessed variability of several of these measures. Paired t-tests were used to compare values between handwalking and bipedal walking. Wilcoxon signed rank tests were used when data were not normally distributed. Correlations between handwalking and bipedal walking variables were obtained using Pearson correlation coefficients. Finally, for the handwalking data, we determined correlations between highest competitive level in gymnastics and each of the spatiotemporal variables. For all tests, a significance level of $p \leq 0.05$ was chosen.

RESULTS

Participants walked more slowly on the hands than on the feet. The average handwalking velocity was 0.53 ± 0.13 m/s and average bipedal walking velocity was 1.17 ± 0.16 m/s. Differences in velocity between handwalking and bipedal walking were still significant when these velocities were normalized to arm or leg length (Figure 1A). Participants also took shorter strides during handwalking (0.56 ± 0.12 m) than during bipedal walking (1.21 ± 0.11 m). Differences in stride length remained significant after normalization to arm or leg length (Figure 1B). Participants used similar cadences for handwalking and bipedal walking (Figure 1C), but used a much wider base of support in handwalking as compared to bipedal walking. Participants spent a significantly larger portion of the gait cycle in stance and double support during handwalking as compared to bipedal walking (Figure 1E, F).

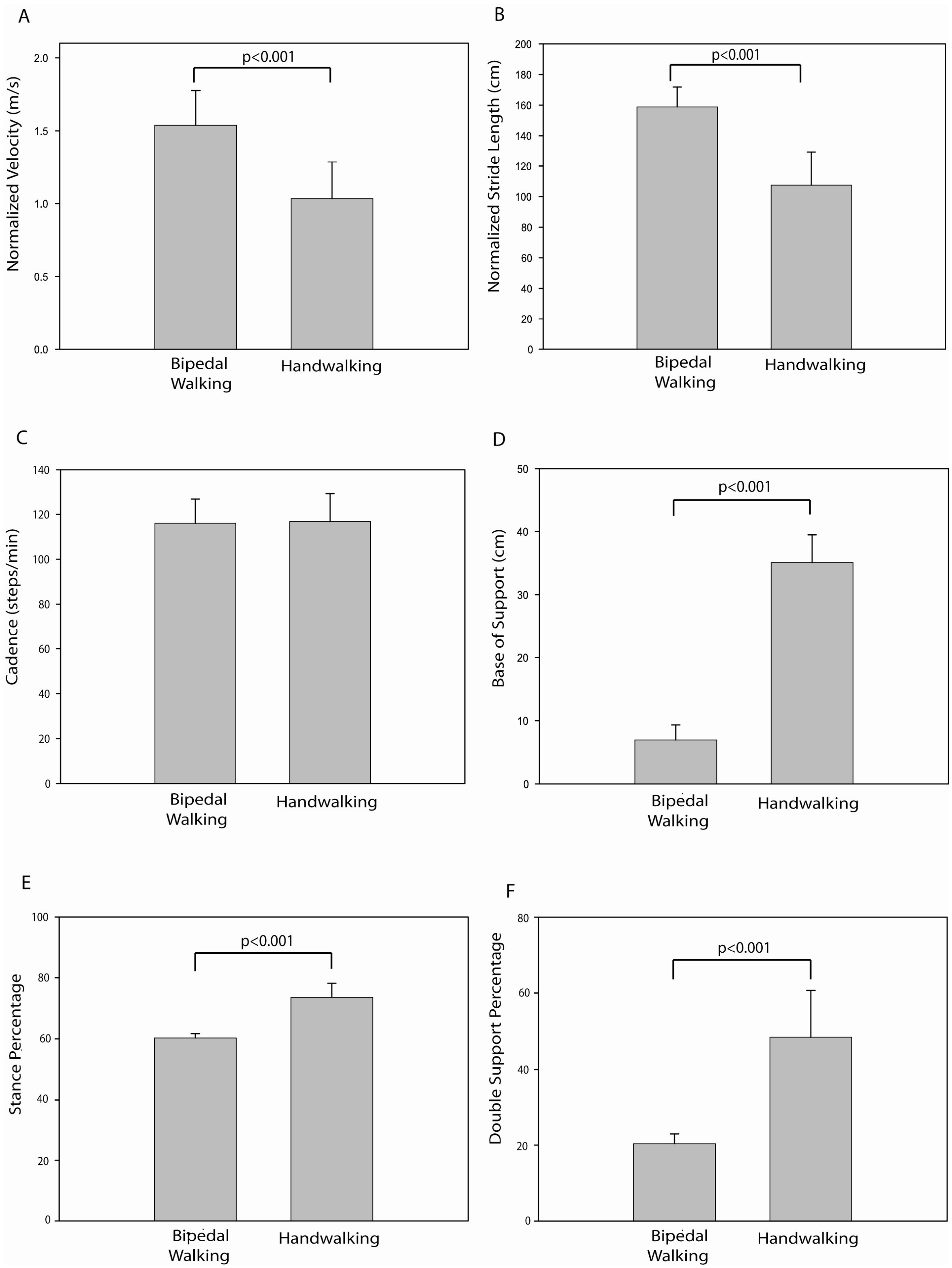

Figure 1. *Group average +/- SD values for normalized velocity (A), normalized stride length (B), cadence (C), base of support (D), stance percentage (E), and double support percentage (F) for handwalaking and bipedal walking.*

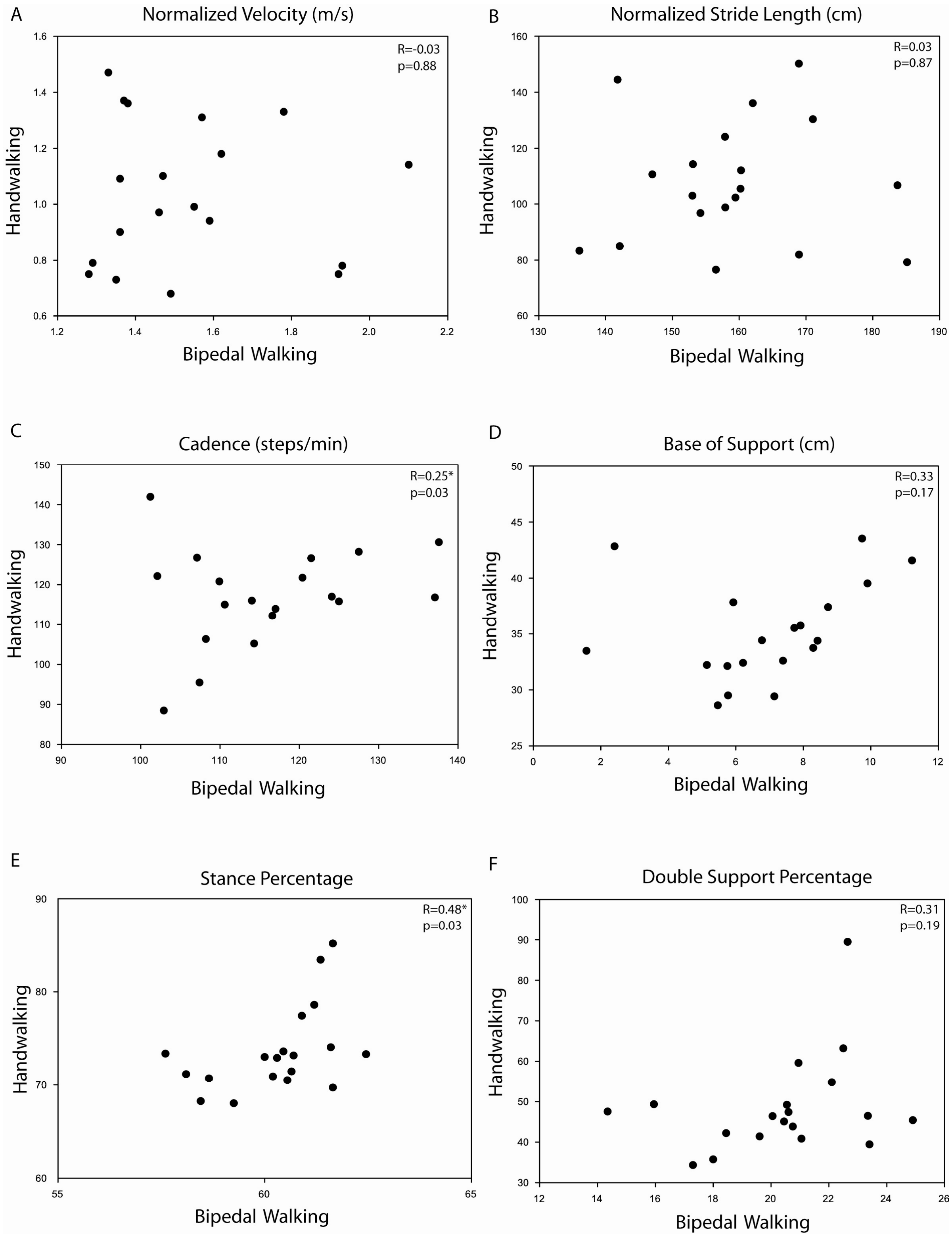

Figure 2. *Scatterplots showing the relationship between values obtained for handwalking (y-axis) and bipedal walking (x-axis) for normalized velocity (A), normalized stride length (B), cadence (C), base of support (D), stance percentage (E), and double support percentage (F).*

Participants were generally more variable in handwalking than in bipedal walking. Average stride-to-stride variability of stride length was 3.3 cm for bipedal walking and 8.1 cm for handwalking ($p < 0.001$). Average stride-to-stride variability in double support percentage was 2.1% for bipedal walking and 19.2% for handwalking ($p < 0.001$). Average stride-to-stride variability of BOS was 2.6 cm for bipedal walking and 3.8 cm for handwalking ($p = 0.01$). Correlational analyses showed only two significant correlations between handwalking and bipedal walking variables (Figure 2). These were for cadence and percentage of the gait cycle spent in stance (Figure 2E). Individuals who spent more time in stance in bipedal walking also spent more time in stance during handwalking. Highest competitive level of gymnastics experience was positively correlated with arm length and handwalking stride length and percentage of the handwalking cycle spent in stance and double support. Highest competitive level was negatively correlated with double support percentage variability (Table 1). Competitive levels were determined using the USA Gymnastics Junior Olympic system (2010).

Table 1. *Correlations of Highest Competitive Gymnastics Level with Handwalking Performance.*

Variable	Correlation Coefficient	P Value
Arm Length	0.76	< 0.001
Stride Length	0.48	0.04
Stance Percent	0.45	0.05
Double Support Percentage	0.58	0.01
Double Support Percentage Variability	-0.53	0.02

DISCUSSION

The only similarity between handwalking and bipedal walking was cadence. There were distinct differences in stride length between handwalking and bipedal walking even when limb length was taken into consideration. This likely stems at least in part from the differing biomechanical constraints at the shoulder versus the hip in the handwalking and bipedal walking positions, respectively. In the handstand position the shoulder is much closer to the maximum limit of shoulder flexion than is the hip in an upright standing posture. As such, there is less available range at the shoulder during handwalking than at the hip during bipedal walking. Given these constraints it is not surprising that stride lengths in handwalking were shorter than those in bipedal walking. The reduced stride length, despite similar cadences, contributed to the slower velocity of handwalking as compared to bipedal walking.

Biomechanical factors may also contribute to the wider BOS used in handwalking as compared to bipedal walking. The presence of the head interposed between the upper extremities during handwalking may physically limit how narrow the BOS can reasonably be in handwalking. In addition, the wider BOS in handwalking may serve to provide greater stability in the mediolateral direction during handwalking.

Handwalking not only had a wider BOS, but also higher stance and double support percentages than bipedal walking. The increase in stance and double support may be a function of the slower velocity of handwalking, as slower velocities have been associated with increased stance and double support in bipedal walking (Murray, Mollinger, Gardner, and Sepic, 1984). Alternatively, or in addition, the increase in stance and double support may be a strategy to compensate for the less stable handwalking position. Interestingly, more highly skilled gymnasts demonstrated higher stance and double support percentages along with a decrease in the variability of double support percentage as compared to less experienced gymnasts. Perhaps experienced gymnasts are better able to adopt the increased stance/double support strategy and can more tightly regulate and reproduce this strategy from stride to stride. This would suggest that the strategy of increased stance/double support is at least in part a learned approach to the task that is effectively used by higher level gymnasts. Adoption of similar strategies of increased stance and double support percentages has been noted in elderly individuals (Winter, Patla, Frank, and Walt, 1990) and in healthy young people in situations where stability is reduced, such as walking on slippery surfaces (Marigold and Patla, 2002). Another possibility is that the increase in double support is a reflection of more deliberate and controlled handwalking. Less skilled gymnasts may not be able to control vertical body position as effectively and may, therefore, sometimes resort to moving the hands to reposition the base of support in order to prevent a fall when the center of mass begins to move as a result of body sway. More experienced gymnasts who are better able to control the handstand position may as a result spend more time in double support because they are able to maintain desired body alignment and take steps when they choose to rather than when they have to do so to prevent a fall.

The positive correlation between gymnastics skill level and arm length or stride length in the present sample may be simply a reflection of the fact that the gymnasts competing at higher levels were older and thus had longer arms providing for longer strides. The general lack of correlations between handwalking and bipedal walking variables suggests that skill in one task does not transfer to the other. This is in agreement with prior work demonstrating no relationship between balance performance in a handstand position versus in an erect posture (Asseman, Caron and Cremieux, 2004).

Several study limitations should be mentioned. These include a relatively small sample size, lack of data for bipedal walking at a speed matched with that of handwalking, and lack of 3-D kinematic data regarding joint angles and movement of specific body segments. As this study is the first ever evaluation of handwalking coordination, it provides preliminary observations that support future work with larger samples, matched speeds, and more sophisticated analyses of movement.

CONCLUSION

The patterns used for handwalking and bipedal walking are quite distinct from one another in several respects, perhaps due in large part to biomechanical constraints and the inherently less stable handwalking position. More skilled gymnasts spend more, rather than less, time with both hands in contact with the ground and are less variable from stride to stride. This knowledge may be used to develop specific coaching strategies for improving handwalking performance. Encouraging longer periods of double support and more consistent stride to stride performance are specific strategies that may be coached, as these are the strategies adopted by more skilled gymnasts.

REFERENCES

Asseman, F., Caron, O. and Cremieux, J. (2004). Is there a transfer of postural ability from specific to unspecific postures in elite gymnasts? *Neuroscience Letters, 358*(2), 83-86.

Gautier, G., Thouvarecq, R. and Chollet, D. (2007). Visual and postural control of an arbitrary posture: the handstand. *Journal of Sport Science, 25*(11), 1271-1278.

Kerwin, D.G. and Trewartha, G. (2001). Strategies for maintaining a handstand in the anterior -posterior direction. *Medicine and Science in Sports and Exercise, 33*(7), 1182-1188.

Marigold, D.S. and Patla, A.E. (2002). Strategies for dynamic stability during locomotion on a slippery surface: Effects of prior experience and knowledge. *Journal of Neurophysiology, 88*(1), 339-353.

Murray, M.P., Mollinger, L.A., Gardner, G.M. and Sepic, S.B. (1984). Kinematic and EMG patterns during slow, free, and fast walking. *Journal of Orthopedic Research, 2*(3), 272-280.

USA Gymnastics, Junior Olympic Program Overview, accessed online March 17, 2010 at: http://www.usa-gymnastics.org/women/pages/overview_jo.php

Winter, D.A., Patla, A.E., Frank, J.S. and Walt, S.E. (1990). Biomechanical walking pattern changes in the fit and healthy elderly. *Physical Therapy, 70*(6), 340-347.

ACKNOWLEDGEMENTS

The authors thank the coaches and gymnasts of Olympiad Gymnastics in Ellisville, MO, USA, for participating in this study. Thanks to John Michael Rotello for assistance with figure production.

Research was conducted within Washington University School of Medicine, Program in Physical Therapy, Department of Neurology and Department of Anatomy and Neurobiology, St. Louis, Missouri, USA.

JUDGES' EVALUATION OF ROUTINES IN MEN ARTISTIC GYMNASTICS

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Original research article

Abstract

For competition judging, the practice of assigning gymnastics judges into one of two groups (D-Jury and E-Jury) is internationally accepted. International judges (the highest level) are placed in the D-Jury and national judges are allocated to the E-Jury. Performance evaluations are the jurisdiction of the E-Judges who record the deductions in the exercises, determining the exercise final score. The purpose of this study was to examine if there were significant differences between D-Jury and E-Jury judges (international vs. national), based on their evaluations of gymnastics performances; allowing for an assessment of the necessity to split judges into these two groups. Twenty experienced judges, who volunteered to participate in the study, were divided into two groups (National vs International). The judges evaluated, via videotape, nine gymnastics routines performed on the rings. Points were deducted (in tenths of units) based on the severity of errors in the routines. According to the results, for the judges level effect the results approached significance and significant differences were found across the 9 separate programs. The observed differences raise questions concerning the existing placement system of judges (international vs. national) in Greece.

Keywords: *artistic gymnastic, judges, evaluation, level of judging.*

INTRODUCTION

In various events in artistic gymnastics (floor exercises, side horse, rings, etc.), it is at the level of the judges' knowledge and experience that a "winner" is decided. For that decision to be made, the judges are engaged in an extensive process related to information concerning the movement patterns observed (Ste-Marie, 1999). For this reason, they record the difficulty values of the elements that are performed (according to the Code of Points that is valid for every Olympic cycle), the connections of these elements (D-Jury) and the technical aspects of these elements (performance, composition) (FIG, 2009). In international competitions, all members of the Juries (D- and E-Panels, Assistants and Secretaries) must possess exact, applicable and thorough knowledge of the F.I.G. Code of Points for men and the F.I.G. rules for judges. They must have successfully participated in an international or intercontinental judges course and possess the corresponding FIG category . Prior to the competition, they participate in the Judges' Review Session (instruction) and the final draw of the judges to their functions.

Literature in this area states that the cognitive and perceptual differences that exist between expert and novice athletes can also be applied to judges, because they can also be classed as "performers", since they evaluate gymnasts' performances (Abernethy and Russell, 1984; Allard, Graham, and Paarsalu, 1980; Allard and Starkes, 1980; Bard and Fleury, 1981). It can be stated that perceptual differences are related to the elements of the display that are selectively attended to (Allard and Starkes, 1980), the way and the speed at which the visual display is searched (Bard and Fleury, 1981) and how quickly the important information is extracted from the visual display prior to movement (Abernethy and Russell, 1984). On the contrary, the cognitive differences between expert and novice athletes refers to the interpretation and organisation of the skill-related information in memory, so as to facilitate superior recall of that knowledge (Allard, Graham, and Paarsalu, 1980).

Previous studies state that expert judges (more than 10 years experience) are superior to novice judges (up to 3 years experience) because they are more effective at interpreting biomechanical information available from the gymnast's body (Abernethy, 1997), they have greater breadth and depth of knowledge (Ste-Marie, 1999) and they can focus on different areas of the body better than novice judges (Bard et al, 1980). In addition, expert judges are more accurate when recognising form errors (correct body positions) than novice judges (Ste-Marie and Lee, 1991). This is because they are more able to predict what elements follow up during performance of one or more combinations of elements (Ste-Marie and Lee, 1991) and can better adhere to the speed of performances in various apparatus (Salmela, 1978).

A gymnasts' final score is calculated as follows: D-Score (from the D-Jury) + E-Score (from the E-Jury) = final score for each apparatus.

The D-Score is concerned with difficulty, element groups and connection values, while the E-Score is concerned with execution and composition. The E-Score is calculated by averaging the middle two of four (or four of six) scores (deductions).

Internationally and nationally, the level of the athlete's performance is evaluated by the judges and there is a common agreement about the final score that the gymnast receives. However, it is often unclear whether the final sum of deductions comes from the same number and kind of faults that receive deductions (small, medium, large, very large).

In Greece, judges are divided into three categories (novice, national and international). International judges have successfully participated in an international or intercontinental judges course. National and novice judges have only participated in national judges' courses. For them, the results of the examination of these courses serve as the main criteria for further categorisation (i.e. from novice to national, from national to international). However, it is the opinion of specialists that experience is of greater value than judging courses.

Although there are no differences in the total number of deductions (sum of deductions) that judges give whilst evaluating athletes' routines, it is unclear whether the sum of deductions comes from the same number of faults or the same technical error. This is even more evident in routines of lower technical level than in routines executed by elite athletes. It is therefore questionable whether differences in scores between experienced judges result from the judges' different category (national, international); whether differences in the final score result from the same technical faults in the same elements; or if they have come from different elements. It is possible that result accuracy would improve in national competitions if international level judges also judged in the E-Jury, allowing for more accurate and objective evaluations. The purpose of this study was to examine if there are significant differences between national and international judges in: a) the total amount of deductions in all the routines performed, b) the total amount of deductions in each routine, c) the deductions for every element separately and d) the deductions between competition and video evaluation.

METHODS

Participants

Twenty experienced national and international judges from the Hellenic Federation Gymnastics volunteered to participate in the study. They were divided into two groups: a) international judges (n=8) with 14.47 ± 4.35 years of judging experience and had judged 80.43 ± 28.43 competitions and b) National judges (n=12) with 6.25 ± 1.55 years of judging experience and had judged 18.50 ± 6.54 competitions. The differences for these two parameters (years of judging and number of competitions) were statistically significant ($p < .05$).

Instruments

Competition routines were recorded using a video camera (JVC GR-Ax2) during an international meeting of artistic gymnastics. The video camera was placed so that the optical axis of the camera was perpendicular with the transverse axis of the performance of the routines on the rings. The distance of the camera from the nearest ring was 3.00 ± 0.20m and the camera's height from the floor was 1.00 ± 0.12m. This placement of the camera is identical to the corresponding position of judges (E-jury) that evaluate the technical execution according to the Code of Points.

Procedure

To evaluate the gymnastics routine, the judges watched the routines via a video link on a monitor. Judges sat one meter from the monitor. Judges independently evaluated the same nine rings routines; each routine contained ten elements resulting in a total of ninety elements. The sum of deductions of every element that was performed was the total score of these deductions in every routine. After the end of each performance element, a black screen appeared for 5 seconds on the monitor, allowing the judges enough time to record the deductions on a record sheet and to prepare for the next performance.

Two expert international judges also evaluated all routines to provide a more objective evaluation and reference point (gold standard) for comparison. The evaluated routines in the preset study represented a broad range of technical gymnastics abilities, thus providing routines with many errors, as well as routines with few errors. The dependent variable, which was the score of each gymnast in the nine routines—as well in each routine separately—was used for statistical analysis (Student's t-test). Statistical significance was set at the 0.05 level.

RESULTS

The scores of the National and International judges across the 9 separate programs and 10 separate exercises are presented in tables 1 and 2 respectively.

Multivariate Analysis of Variance (MANOVA) was used to examine the differences between National and International judges in the deductions across the separate exercises. The multivariate and univariate post hoc results were not significant (Λ= .926, F= 1.349, p= .208, n^2= .074), indicating that the two groups of national and international judges were not significantly different when evaluating the deductions across the 10 separate exercises. The overall univariate post hoc findings are presented in table 3.

We examined the interaction between judge's level (International vs National) and programs (9 separate programs), with respect to the judges' evaluation score. The interaction effect of the 2 X 9 independent groups ANOVA was not significant (F=. 588, p=.786, η^2=.028). Accordingly, we examined the main effects for judge's level and programs. For the judge's level effect, the results approached significance (F= 3.881, p= .051, η^2= .023) and significant differences were found across the 9 separate programs (F= 11.633, p= .000, η^2= .365). The post hoc LSD test was used to detect the sources of significance across the 9 separate programs. The overall findings are presented in table 4.

Table 1. *Mean scores (deductions) of judges, across separate programs.*

Variable	M	SD	N
Program 1			
National	178.33	57.18	12
International	**183.75**	**65.88**	**8**
Program 2			
National	266.67	72.15	12
International	237.50	69.02	8
Program 3			
National	127.50	61.07	12
International	118.75	64.01	8
Program 4			
National	166.67	78.66	12
International	143.75	79.45	8
Program 5			
National	189.17	62.88	12
International	131.25	57.18	8
Program 6			
National	135.00	48.71	12
International	108.75	24.74	8
Program 7			
National	156.67	41.63	12
International	140.00	27.25	8
Program 8			
National	92.50	41.14	12
International	102.50	62.28	8
Program 9			
National	132.50	45.15	12
International	122.50	46.83	8

Table 2. *Mean scores (deductions) of judges, across separate exercises.*

Variable	M	SD	N
Exercise 1			
National	1.62	1.44	108
International	1.36	1.20	72
Exercise 2			
National	2.07	1.14	108
International	1.90	1.22	72
Exercise 3			
National	1.48	1.27	108
International	1.55	1.34	72
Exercise 4			
National	2.75	1.98	108
International	2.29	1.75	72
Exercise 5			
National	1.38	1.16	108
International	1.33	1.09	72
Exercise 6			
National	1.44	1.31	108
International	1.14	1.06	72
Exercise 7			
National	1.64	1.14	108
International	1.33	0.98	72
Exercise 8			
National	1.15	1.12	108
International	1.35	1.43	72
Exercise 9			
National	0.68	0.99	108
International	0.79	1.10	72
Exercise 10			
National	1.79	1.97	108
International	1.26	1.92	72

Table 3. *ANOVA table, examining the differences between international vs national level judges, across the 10 separate exercises.*

Effect		SS	df	MS	F	p	n^2
Exercice 1							
	BG	2.904	1	2.904	1.595	.208	.009
	WG	324.046		178	1.820		
Exercice 2							
	BG	1.268	1	1.268	.918	.339	.005
	WG	245.727		178	1.380		
Exercice 3							
	BG	.237	1	.237	.140	.708	.001
	WG	300.741		178	1.690		
Exercise 4							
	BG	9.445	1	9.445	2.649	.105	.015
	WG	634.616		178	3.565		
Exercise 5							
	BG	.093	1	.093	.072	.788	.000
	WG	227.435		178	1.278		
Exercise 6							
	BG	4.033	1	4.033	2.727	.100	.015
	WG	263.278		178	1.479		
Exercise 7							
	BG	4.033	1	4.033	3.470	.064	.019
	WG	206.917		178	1.162		
Exercise 8							
	BG	1.712	1	1.712	1.081	.300	.006
	WG	281.949		178	1.584		
Exercise 9							
	BG	.490	1	.490	.471	.493	.003
	WG	185.171		178	1.040		
Exercise 10							
	BG	12.245	1	12.245	3.208	.075	.018
	WG	679.505		178	3.817		

BG. Between groups
WG. Within groups

Table 4. *Post hoc LSD test examining significance across the 9 separate programs.*

	Mean Difference							
program	2	3	4	5	6	7	8	9
1	-74.50*	56.50*	23.00	14.50	56.00*	30.50	84.00*	52.00*
2		131.00*	97.50*	89.00*	130.50*	105.00*	158.50*	126.50*
3			-33.50	-42.00*	-0.50	-26.00	27.50	-4.50
4				-8.50	33.00	7.50	61.00*	29.00
5					41.50*	16.00	69.50*	37.50*
6						-25.50	28.00	-4.00
7							53.50*	21.50
8								-32.00
9								

*: $p < .05$

DISCUSSION

It should be noted that the interaction effect between judges category and programs in the present study—with respect to the evaluation score—was not significant. Although international judges have considerably more years and competitions of judging experience, the years of judging experience of national judges provides sufficient knowledge to identify errors in gymnastics routines. However these results should be interpreted with caution, because the sum of deductions between these two categories of judges weren't from the same errors and the same severity (degree of error). This means that judges in these two categories may differ in declarative knowledge (Ste-Marie, 1999), meaning they "record" errors in a different way. It is clear that an attempt has been made internationally to minimise the subjectivity in the judging process and although judges aim to evaluate in an objective way, we should mention that the judging procedure is based on judges' own perceptions of what constitutes the 'perfect performance'.

Based on the findings from this study, judges evaluated different deductions for errors in separate programs. These findings are similar to findings from previous studies in this area (Ste-Marie, 1999; Ste-Marie and Lee, 1991). Possibly these statistically-significant differences in the deductions in each element are a result of insufficient comparison of the deviation of the technique of the element performed with the perfect technique. Bard et al., (1980) supported that novice and experienced judges focus their attention in "different areas" of the body of the athletes, agreeing with the results of Tenenbaum and his colleagues (1996), who also supported that judges gain experience and become better at their work in every competition.

According to Ste-Marie (1999) and Thomas (1994), the amount of declarative and procedural knowledge is different between national and international judges. Knowledge concerning real information based on specific rules and decision for movement (exercise) possibly differs between national and international judges. The present findings are in conflict with Ste-Marie and Thomas, since no significant differences were evident between national and international level judges. The results, however, approached significance and replication study may be necessary in the future to confirm the present findings. Further, the nine separate programs were associated with athlete's high speed performance, a factor that according to Salmela (1978) is associated with judging errors and is a decisive factor for the accuracy of evaluation. We suggest with caution that previous athletic experience of the judges— if they have been athletes in gymnastics or not—may also affect their evaluations. It could also be supported that the complexity of the “multi-joint” system of the human body is also affecting the evaluation from the judges.

Finally, the differences that were revealed between real marks given during competition and those that were given through video evaluation agree with the theory of Puhl (1980), who stated that isolated presentation of the elements through video is giving the judges the possibility to evaluate with more precision. It is possible that the speed of performance and the different connections of the elements during competition also influence the accuracy of the evaluation. This is supported by the results of previous studies (Salmela, 1978).

The results of the present study agree with other findings (Abernethy, 1997, Ste-Marie, 1999) which support that experienced judges better interpret the biomechanical information coming from the athlete’s body and need to focus their attention less on the performance, allowing them to concentrate more on the analysis of the element. Additionally—as already observed in the present research—based on the differences of the deductions in isolated routines there is a difference in the capacity of “anticipation through perception” between national and international judges. This fact is in agreement with findings of previous research (Ste-Marie and Lee, 1991; Tenenbaum et al, 1996). In conclusion, we can say that the accuracy of judging between national and international judges is satisfactory based on the very small percentage of statistically-significant differences in the total amount of deductions in all the routines.

Though all judges that participated in this study have a sufficiently long practicing experience, there are some differences in the evaluation between national and international judges. Probably these differences result from different opinions and knowledge about the performance of the elements or from personal experience, or from differing ability to recognise the nature of mistakes. For the elimination of these differences the presence of international judges in the E-panel is recommended. Special judges’ courses to present and analyse the mistakes of performance of the elements and the resulting deductions from the judges will contribute to a fair result.

REFERENCES

Abernethy, B. (1997) Movement expertise: A juncture between psychology, theory, and practice. Paper presented at the meeting of the Association for the Advancement of Applied Sport Psychology, San Diego, CA, June.

Abernethy, B. and Russell, D.G. (1984) Advance cue utilization by skilled cricket batsmen. *The Australian Journal of Science and Medicine in Sport*, 16, 2, 2-10.

Allard, F., Graham, S. and Paaraslu, M.E. (1980) Perception in sport: Basketball. *Journal of Sport Psychology,* 2, 14-21.

Allard, F. and Starkes, J.L. (1980) Perception in sport: Volleyball. *Journal of Sport Psychology*, 2, 22-33.

Bard, C. and Fleury, M. (1981) Considering eye movement as a prediction of attainment. In I.M. Cockerill and W.W. MacGillivray (eds.), *Vision and Sport* (pp.28-41). Chetenham, UK: Stanley Thornes Publishers.

Bard, C., Fleury, M., Carriere, L. and Halle, M. (1980) Analysis of gymnastic judges’ visual search. *Research Quarterly for Exercise and Sport*, 51, 267-273.

Federation International Gymnastics (2009) The Code of Points. Lucerne, Switzerland: Raeber.

Puhl, J. (1980) Use of video replay in judging gymnastics’ vaults. *Perceptual and Motor Skills*, 51, 51-54.

Salmela, J.H. (1978) GYMNASTIC JUDGING: A complex information processing task, or (Who’s putting one over on who?). *International Gymnast,* 20, 54-57, 62-63.

Ste-Marie, D.M. and Lee, T.D. (1991) Prior processing effects on gymnastic judging, *Journal of Experimental Psychology*, 17, (1), 126-136.

Ste-Marie, D.M. (1999) Expert-Novice Differences in Gymnastic Judging: An Information-processing Perspective. *Applied Cognitive Psychology*, 13: 269-281.

Tenenbaum, G., Levy-Kolker, N., Sade, S., Lieberman, D.G. and Lidor, R. (1996) Anticipation and confidence of decisions related to skill performance. *International Journal of Sport Psychology,* 27, 293-307.

Thomas, K. T. (1994) The development of sport expertise: From Leeds to MVP legend. *Quest,* 1994, 46, 199-210.

BASIC LANDING CHARACTERISTICS AND THEIR APPLICATION IN ARTISTIC GYMNASTICS

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Review article

Abstract

Landings are extremely important in gymnastics to improve athlete performances as well as to reduce injuries. Studies on landings therefore provide an interesting field of research in which numerous studies have been conducted. This article gives an overview of the results from these studies that can be used by coaches to improve teaching on landing techniques. The biomechanical characteristics and motor control of landings is reviewed.

Keywords: *gymnastics, landings, kinematics, dynamics, motor control.*

INTRODUCTION

Landing is the final phase in aerial routines (take off phase, flight phase, and landing). Landing is important for success in gymnastics and is therefore of interest to researchers and coaches who want to improve landing performances.

Landing success depends on the physical fitness (preparation) and motor control of the gymnast. Physical preparation refers to the gymnast's ability to cope with the load to which they are exposed during the landing. Motor control refers to the control the gymnast has over the skill they perform. Both of these factors enable successful and safe landings.

Results from various studies show a low success rate of landings in competition (McNitt Gray, Requejo, Costa, and Mathiyakom, 2001; Prassas and Gianikellis, 2002). During the Olympic games 1996 in Atlanta McNitt Gray et. al. (1998) investigated landings from the high bar and parallel bars. Competitors performed twenty landings. Only one was performed without a mistake. At the European Championships in 2004, of all the saltos performed on the floor, 30 % were performed without error and 70 % were performed with errors (Marinšek, 2009).

KINEMATIC AND DYNAMIC CHARACTERISTICS OF LANDING

Landings in gymnastics are performed with first contact of the lateral part of the foot followed by the medial part (25 ms to 32 ms). The heel touches the ground between 27 ms and 52 ms later than the toes (Janshen, 1998). The ankle joint angle change (25^0 to 30^0) during the landing is less than that of the knee joint (79^0 to 89^0). Depending on the angle of the knee joint, landings are categorised as either stiff or soft. Landings where the knee angle is smaller than 63^0 are classed as stiff landings, and those where the knee angle is greater than 63^0 are classed as soft landings (Devita and Skelly, 1992). For soft landings there must be a contraction of at least 117^0 at the knee joint.

Depending on the height and type of landing, different force magnitudes are developed. A higher flight phase results in a higher vertical ground reaction force. Vertical ground reaction force represents external force which the gymnasts have to overcome with their muscle force and has an impact on the gymnast's linear and angular momentum. A variable that also affects linear and angular momentum is the time that the landing takes to perform. Impulse of force is the product of force and time; this is represented by the area below the curve in Figure 1. The impulse of the force is a consequence of the gymnast's weight and velocity, so its quantity cannot be changed at landing. The goal of landing is to change the shape of the area below the curve. Gymnasts can alter the shape of the area by increasing the time taken to perform the landing. Gymnasts can achieve this by increasing hip, knee, and ankle amplitude.

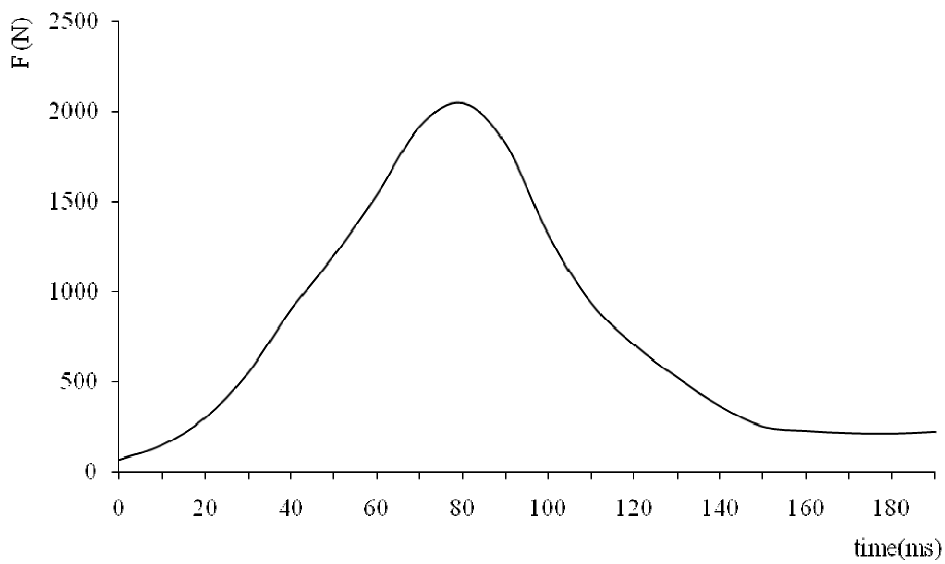

Figure 1. *Landing shown as the force – time relationship.*

As the height from which a landing is performed increases, muscles are required to respond more quickly, however, bodily movements maintain the same course (Devita and Skelly, 1992; Arampatzis, Brügemann and Klapsing, 2002; Arampatzis, Morey Klapsing and Brügemann, 2003). With the increase of height the amplitude in ankles, knees and hips rises. During stiff landings the ankles and knees are the most loaded joints and during soft landings hips are the most loaded joints (Zhang, Bates and Dufek, 2000).

Top level gymnasts use different landing techniques compared to recreational gymnasts (McNitt Gray, 1993). Recreational gymnasts use a higher range of motion in the knees and hips compared to top level gymnasts. Top level gymnasts use less motion in the knees and hips. One of the reasons for higher forces at landings of top level gymnasts is higher pre-activation of muscles (Metral and Cassar, 1981; Devita and Skelly, 1992; McNitt Gray, 1993; Janshen, 1998, 2000). Higher pre-activation is the activation of the muscles prior to touchdown and enables gymnasts to actively absorb energy and lower the loading on the heel (Nigg and Herzog, 1998). This results in improved stability of the ankle during the support phase (Janshen and Brüggemann, 2001).

Drop landings differentiate between gymnasts and non-gymnasts. It has been shown that drop landings performed by female collegiate gymnasts result in higher vertical ground reaction forces than drop landings performed by non-gymnasts (Sabick, Goetz, Pfeiffer, Debeliso and Shea, 2006). Collegiate gymnasts display greater symmetry in peak vertical force distribution in landings compared to non-gymnasts. The improved symmetry in gymnasts is, according to researchers, an adaptation to the large ground reaction forces experienced during landings in their sport.

Forces experienced during take-offs and landings in artistic gymnastics can be very high. Forces measured at landings can range from 3.9 to 14.4 times the gymnast's body weight (Panzer, 1987; McNitt Gray, 1993). The highest forces measured when performing double back somersaults ranged from 8.8 to 14.4 times the gymnast's body weight. This was 6.7 times more body weight compared to back somersault. Karacsony and Cuk (2005) found that forces at take off at different somersaults can be up to 13.9 times the participant's body weight.

At landing, two peaks of vertical ground reaction force are formed. The first peak indicates toe contact and the second peak the contact of the sole of the foot with the surface. The first peak is usually small and is seen as a declination in curve (Figure 1). The second peak is normally greater than the first one and represents the maximal force.

Foot position is an important aspect of gymnastics landings. Different techniques show significant differences in several kinematic and dynamic parameters (Cortes et al., 2006; Kovacs et al., 1999). The 'heels first' technique results in higher vertical ground reaction force, smaller contraction in knees and knee valgus compared to the “toes first” technique. When landing with higher forces, knee valgus forces tend to transmit to the knees and spine which may cause serious injuries. Increased forces on the knee valgus during landings has been identified as a risk factor for anterior cruicate ligament injury (Chappell, Creighton, Giuliani, Yu and Garrett, 2007; Sell et al., 2007; Withrow, Huston, Wojtys, and Ashton Miller, 2006; Blackburn and Padua, 2008). The most loaded joints during landing with the heels first are the knees and hips. When a heel first landing is performed, the shape of the force-time curve changes significantly (Figure 2). The maximal force is achieved more quickly and is also greater in magnitude. When a toes first landing is performed, the highest forces are developed in the achilles tendon (Self and Paine, 2001). Higher activation of ankle muscles enables gymnasts to lower the loading on the heel (Nigg and Herzog, 1998). Cadaver study (Self and Paine, 2001) showed that sportsmen don't use all of their potential to actively absorb forces at landings. In light of these findings gymnasts should try to land using the toes first technique. This is highly connected to the take-off phase in the sense of gaining adequate momentum to allow sufficient time to prepare for contact with the landing surface.

Different researchers (Tant, Wilkerson and Browder, 1989; McNair and Prapavessis, 1999; Prapavessis and McNair, 1999; Onate, Guskiewicz and Sullivan, 2001; Zivcic Markovic and Omrcen, 2009) found that systematical teaching of landings decreases the loadings at landings. Proper landing techniques can help prevent injuries.

To perform safe landings gymnasts must be physically prepared to overcome the loadings at landings. During training it is important to develop upper leg and lower leg strength. Treatment with only isometric contraction of the upper leg results in increased activation of the upper leg muscles and decreased activation of the lower leg muscles. This results in a more rapid heel-ground contact with increased force (Janshen, 1998). Treatment with isometric contraction of the calf muscles results in increased foot stabilization via dorsal extension and pronation leading to reduced ground reaction force under the heel.

When planning conditioning, coaches must consider the development of upper body strength. Aerial skills that involve twisting around gymnast's longitudinal axis tend to load not only the legs but also the spine at landings. Leg joints and spine are especially loaded when gymnasts use contact twist technique. When using the contact twist technique the gymnast will be twisting during the landing, which can result in spine and leg injuries (Yeadon, 1999). Therefore it is important for gymnasts to improve their core stability.

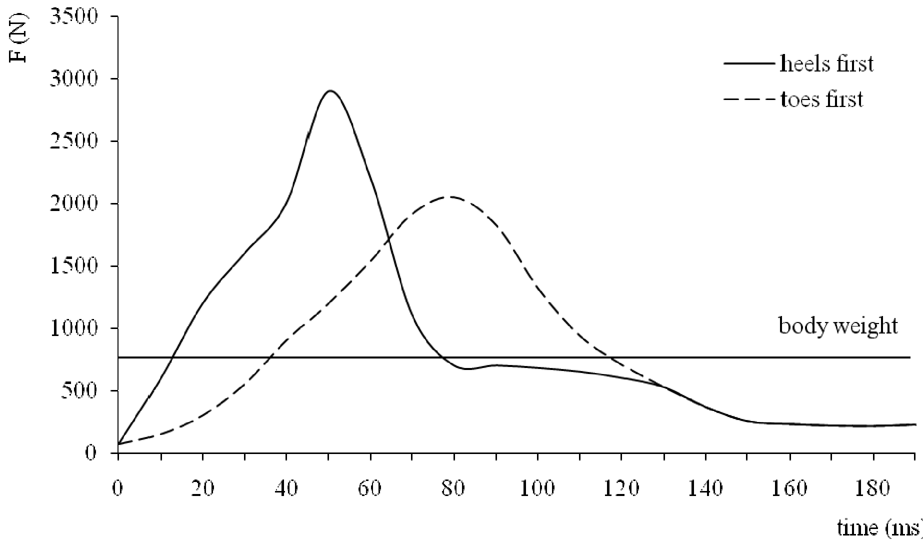

Figure 2. *Two differente type of landings.*

HOW DO GYMNASTS CONTROL LANDINGS?

Magnitude of impact forces during landings tend to increase not only with the increase of falling height, and therefore increase in impact velocity, but also with the skill complexity (Panzer, 1987; McNitt Gray, Munkasy, Welch and Heino, 1994; Karacsony and Čuk, 2005; Marinšek and Čuk, 2007; Marinšek, 2009).

Gymnasts begin to prepare for landing during the flight phase. In order to increase stability during contact with the landing surface they have to distribute momentum among body segments and prepare muscles for loading.

Gymnasts can distribute momentum among body segments through flexion/extension in different joints. The aim of these movements is to achieve conditions at contact consistant with those of a successful landing. The movements depend on aerial skill characteristics and momentum acquired at the take off phase (Marinšek and Čuk, 2007). Modifications of one subsystem may be sufficient to achieve the task objectives of landing (Requejo, McNitt Grey and Flashner, 2002; Requejo, McNitt Grey and Flashner, 2004). Modifications in the trunk-arm subsystem may be an effective mechanism for controlling total body movement of inertia, and enables gymnasts to maintain lower extremity kinematics after contact. Gymnasts should try to put their arms in an upward position before the landing, as the fewest number of errors was found during landings when gymnasts had their arms in an upward position (Marinšek and Čuk, 2008). Gymnasts can also use their arms to control the landing after the contact. They can circle their arms in the same or the opposite direction to the direction of movement. Modifications with hands help them to preserve and transfer total body movement of inertia (Prassas and Gianikellis, 2002).

The landing and take off phase of aerial skills are programmed independently (McKinley in Pedotti, 1992). The goal of take-off movements is to produce as much energy as possible at the end of the take-off. On the other hand the goal of landing is to absorb energy. Take off movements are normaly eccentric – concentric contractions and landings eccentric contractions (concentric contraction exists but can not be connected to eccentric in the sense of muscle control). For this reason it is important to distinguish these two movements in teaching methods. During landing a special mechanism must make it possible to contract the muscles and at the same time keep the muscle stiffness low (Dyhre-Poulsen, Simonsen and Voigt, 1991).

Motor programme for landing is always pre-programmed (Dyhre Poulsen, Simonsen and Voigt, 1991). Preparation of muscles on loading starts from 150 to 170 ms before first contact and is seen as electrical activity in muscles. Motor control system predicts fall time and initiates muscle activity at a time appropriate to expected impact (Duncan and McDonagh, 2000). The pattern of motor programme for landings is always the same and does not change with the falling height. What changes is muscle activity that adapts to the height of the flight phase (Dyhre-Poulsen, Simonsen and Voigt, 1991). As falling height increases, muscle activity (and therefore muscle stiffness) of the lower limbs increases during the pre-activation phase, and during the landing itself (Arampatzis, Morey Klapsing and Brügemann, 2003). In order to regulate reaction forces during landings, feedforward and feedback control is being used by the nervous system (Munaretti, J., McNitt Gray and Flashner, 2006). The feedforward system defines muscle excitability, and the feedback system controls the movement. For landings it is important that excitability of α motor neurons is low, and the gymnast receives as much internal and external information during the landing phase as possible.

One of the most important pieces of information that contributes to landing success is visual information. Visual guidance during falls in which environmental cues are known is not necessary in order to adopt a softer landing strategy (Liebermann and Goodman, 1991) but does improve precision of control (Lee, Young and Rewt, 1992). Visual control helps gymnasts to distribute momentum among body segments (e.g. moving their arms) at the right moment and create the best position for landing.

When performing back tuck somersaults visual feedback enhances landing stability and yields better landing scores (Luis and Tremblay, 2008). Optimal feedback occurs when the retina is stable. Different visual conditions affect some of the execution parameters. Narrowing peripheral vision does not affect the kinematic characteristics of landing and landing balance. However, the absence of vision causes less stable landings compared to the full and narrowed vision field (Davlin, Sands and Shultz, 2001a). Gymnasts are more stable at landing under conditions that allow vision during either the entire somersault or the last half of the somersault. However, different vision conditions do not affect trunk and lower body kinematics (Davlin, Sands and Shultz, 2001b).

When gymnasts perform a more difficult skill (double back somersault), and when visual feedback during the performance is possible, they slow their heads prior to touchdown in time to process optical flow information and prepare for landing (Hondzinski and Darling, 2001). There is not always enough time to process vision associated with object identification and prepare for touchdown. Therefore it can be concluded that gymnasts do not need to identify objects for their best double back somersault performance.

In view of the research findings, gymnasts should try to gain visual information during the entire aerial skill, and in the last half of the aerial skill stabilize their head in order to get the best quality visual information.

DO SURFACE CHARACTERISTICS AFFECT LANDING?

When talking about landings, it is also important to consider the stiffness of the surface gymnasts are landing on. Surfaces vibrate and deform when exposed to loads. Vibration of the surface depends on the magnitude and direction of the force applied, and the stiffness of the surface. Stiffer surfaces tend to vibrate with higher frequency and smaller amplitude compared to compliant surfaces (Figure 3).

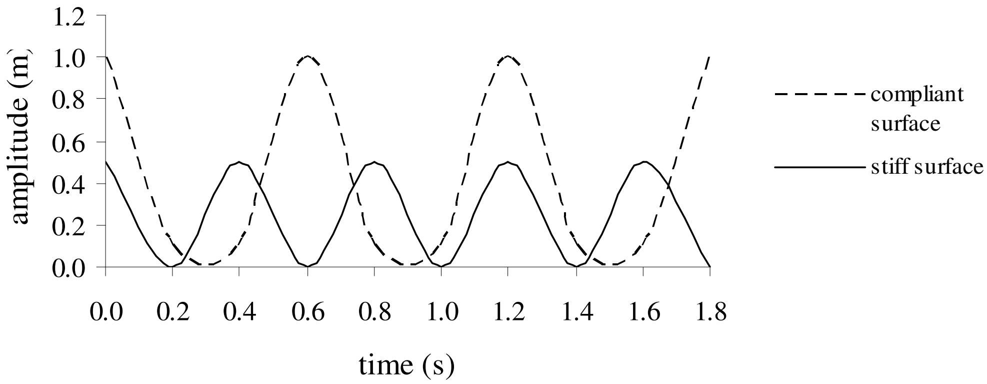

Figure 3. *Amplitudes and frequencies of surfaces of different stiffnesses.*

The aim of landing is to dampen the vibrations of the surface. The surface deforms because of the impulse of the force that is produced by the gymnast's falling body. To dampen the vibrations it is important to harmonize muscle activity with the surface vibrations i.e. modulate body stiffness in response to changes in surface conditions.

Different surface conditions affect landing strategies. If landing on a mat, peak vertical forces are lower, landing phase times are longer, and knee and hip flexions are greater compared to landing without a mat (McNitt Gray, Takashi and Millward, 1994). When comparing landings on stiff or soft mat, knee flexion and peak knee flexion velocities tend to be greater for landings on the stiff mat than on the soft mat. Gymnasts modulate total body stiffness in response to different landing conditions. Mat landings tend to be softer than landings without a mat. However, the presence of a mat may reduce the need for joint flexion and may alter the vertical impulse characteristics experienced during landing. Therefore coaches should pay attention to landing executions during training regardless of the surface conditions gymnasts are landing on.

One of the factors that influences landings is the construction of the mat. Coaches should ensure that they obtain good quality mats. Mat construction influences the motion of the foot. The mechanical advantages of a soft mat (higher energy absorption) include a decrease in foot stability (Arampatzis, Brüggemann and Klapsing, 2002). The eversion at the calcaneocuboid joint increases with the height (Arampatzis, Morey Klapsing and Brügemann, 2003). On the other hand the falling height does not show any influence on the tibiotalar and talonavicular joints during landing. With the special stabilising interface inserted in the mat it is possible to reduce the influence of the mat deformation on the maximal eversion between forefoot and rearfoot (Arampatzis, Morey Klapsing and Brügemann, 2005).

CONCLUSION

Landings in gymnastics, because of their importance in competitive gymnastics and number of injuries that result from them, are a very interesting area of research. Injuries sustained during landings result in time lost in training and competitions. Therefore coaches should ensure correct landing techniques are being taught. Coaches must be aware that when gymnasts land they use special mechanisms to control their movement. In this sense landings are different from other gymnastics movements, and need to be practiced thoroghly. Mechanisms used to absorb the external loading at landings are modified according to the stiffness of the landing surface. When soft mats are used the absorption of energy is increased, but also leads to a decrease in foot stability. In some cases the presence of the mat may even reduce the need for joint flexion and result in higher forces. It is therefore important to practice landing on different surfaces during training sessions. Coaches also have to be aware of the high loadings their gymnasts are exposed to during landings. Repeated landings, and the forces experienced during these landings contribute to the serious injuries experienced by many gymnasts. For these reasons emphasis must be placed on learning and practicing correct landing techniques.

REFERENCES

Arampatzis, A., Brügemann, G. P. and Klapsing, G. (2002). A three – dimensional shank – foot model to determine the foot motion during landings. *Medicine and Science in Sports and Exercise*, 34(1), 130-138.

Arampatzis, A., Morey – Klapsing, G. and Brüggemann, G. P. (2003). The effect of falling height on muscle activity and foot motion during landings. *Journal of Electromyography and Kinesiology,* 13(6), 533 – 544.

Arampatzis, A., Morey – Klapsing, G. and Brüggemann, G. P. (2005). Orthotic effect of a stabilising mechanism in the surface of gymnastic mats on foot motion during landings. *Journal of Electromyography and Kinesiology,* 15(5), 507 – 515.

Blackburn, J.T. and Padua, D.A. (2008). Influence of trunk flexion on hip and knee joint kinematics during a controlled drop landing. *Clin Biomech (Bristol, Avon)*, 23(3), 313 – 319.

Chappell, J.D., Creighton, R.A., Giuliani, C., Yu, B. and Garrett, W.E. (2007). Kinematics and electromyography of landing preparation in vertical stop-jump: risk for noncontact anterior cruciate ligament injury. *The American Journal of Sports Medicine*, 35(2), 235 – 241.

Cortes, N., Onate, J., Abrantes, J., Gagen, L., Van Lunen, B., Dowling, E. and Swain, D. (2006). Kinematic analysis of jump – landing technique during various foot – landing styles. *Medicine and Science in Sports and Exercise*. 38(5) Supplement: S392.

Davlin, C.D., Sands, W.A. and Shultz, B.B. (2001a). Peripherial vision and back tuck somersaults. *Percept Mot Skills,* 93 (2), 465 - 471.

Davlin, C.D., Sands, W.A. and Shultz, B.B. (2001b). The role of vision in control of orientation in a back tuck somersault. *Motor Control,* 5 (4), 337 - 346.

Devita, P. and Skelly, W. A. (1992). Effect of landing stiffness on joint kinetics and energetics in the lower extremity. *Medicine and science in sports and exercise*, 24(1), 108 – 115.

Duncan, A. and McDounagh, M.J.N. (2000). Stretch reflex distinguished from pre-programmed muscle activations following landing impacts in man. *Journal of physiology* 526 (2), 457 – 468.

Dyhre-Poulsen, P., Simonsen, E.B. and Voigt, M. (1991). Dynamic control of muscle stiffness and H reflex modulation during hopping and jumping in man. *Journal of physiology* 437, 287 – 304.

Hondzinski, J.M. in Darling, W.G. (2001). Aerial somersault performance under three visual conditions. *Motor Control*, 5 (3), 281 - 300.

Janshen, L. (1998). Neuromuscular control during gymnastic landings. V Arsenault, B., McKinley, P. in McFadyen, B. (Ed.): *Proceedings of the Twelfth Congress of the International Society of Electromyography and Kinesiology (ISEK)* (str. 136 – 137). Montreal, Kanada.

Janshen, L. (2000). Neuromuscular control during gymnastic landings II. In: Hong, Y. and Johns, D.P. (Ed.): Proceedings of XVIII International Symposium on Biomechanics in Sports. Hong Kong, China.

Janshen, L. and Brüggemann, G.P. (2001). Neuromuscular control during expected and unexpected landings. In Gerber, H. in Müller, R. (Ed.). *Proceedings of the XVIIIth Congress of the International Society of Biomechanics*. Zurich, Switzerland

Karacsony, I. and Cuk, I. (2005). *Floor exercises – Methods, Ideas, Curiosities, History.* Ljubljana: STD Sangvincki.

Kovacs, I., Tihanyi, J., Devita, P., Racz, L., Barrier, J. and Hortobagyi, T. (1999). Foot placement modifies kinematics and kinetics during drop jumping. *Medicine and Science in Sports and Exercise,* 31(5), 708 – 716.

Lee, D.N., Young, D.S. and Rewt, D. (1992). How do somersaulters land on their feet? *Journal of Exp Psychology: Human Perception and Performance,* 18 (4), 1195 - 1202.

Liebermann, D.G. and Goodman, D. (1991). Effects of visual guidance on the reduction of impacts during landings. *Ergonomics*, 34(11), 1399 – 1406.

Luis, M. in Tremblay, L. (2008). Visula feedback use during a back tuck somersault: evidence for optimal visual feedback utilization. *Motor Control,* 12 (3), 210 - 218.

Marinšek, M. (2009). Landing characteristics in men's floor exercise on European Championship 2004. *Science of Gymnastics Journal,* 1(1), 31 – 39.

Marinšek, M. and Čuk, I. (2007). Theoretical model for the evaluation of salto landings in floor exercise. In N. Smajlovic (Eds.), *International Symposium New Technologies in the sport* (p. 63-68). Sarajevo: Univerzitet, Fakultet sporta i tjelesnog odgoja.

Marinšek, M. and Čuk, I. (2008). Landing errors in men's floor exercise. *Acta Univ. Palacki. Olomuc., Gymn.*, 38(3), 29 – 36.

McKinley, P. and Pedotti, A. (1992). Motor strategies in landing from a jump: the role of skill in task execution. *Experimental brain research* 90 (2), 427 – 440.

McNair, P.J. and Prapavessis H. (1999). Normative data of vertical ground reaction forces during landing from a jump. Journal of science and medicine in sport / Sports Medicine Australia, 2(1), 86 – 88.

McNitt – Grey, J. (1993). Kinetics of the lower extremities during drop landings from three heights. *Journal of Biomechanics*, 26(9), 1037 – 1046.

McNitt Gray, J. L., Munkasy, B. A., Welch, M. and Heino, J. (1994). External reaction forces experienced by the lower extremities during the take-off and landing of tumbling skills. *Technique,* 14, 10 – 16.

McNitt Gray, J. L, Munkasy, B. A., Costa, K., Mathiyakom, D., Eagle, J., and Ryan, M. M. (1998). Invariant features o multijoint control strategies used by gymnasts during landings performed in Olympic competition. In North American Congress of Biomechanic (p. 441-442). Canada – Ontario: University of Waterloo.

McNitt Gray, J. L., Requejo, P., Costa, K. and Mathiyakom W. (2001). *Gender Differences in Vault LandingLocation During the Artistic Gymnastics Competition of the 2000 Olympic Games: Implications for Improved Gymnast/Mat Interaction.* Retrieved 28.6.2006, from http://coachesinfo.com/category/gymnastics/74/

McNitt Gray, J., Takashi Y., and Millward, C. (1994). Landing strategies used by gymnasts on different surfaces. *Journal of Applied Biomechanics*, 10, 237 – 252.

Metral, S. and Cassar, G. (1981). Relationship between force and integrated EMG activity during voluntary isometric anisotonic contaraction. *European Journal of Applied Physiology*, 41(2), 185 – 198.

Munaretti, J., McNitt Gray, J.L. and Flashner, H. (2006). Modeling control and dynamics of activities involving impact. Annual ASB meeting. Virginia Tech, VA. Retrieved 18.2.2008, from www.asbweb.org/conferences/2006/2006.html

Nigg, B.M. and Herzog, W. (1998). *Biomechanics of the musculo – skeletal system.* Second Edition. Wiley, Chichester.

Onate, J.A., Guskiewicz, K.M. and Sullivan, R.J. (2001). Augmented feedback reduces jump landing forces. *J Orthop Sports Phys Ther*., 31(9), 511 – 517.

Panzer, V. P. (1987). *Lower Extremity Loads in Landings of Elite*

Gymnasts. Doctoral dissertation, Oregon: University of Oregon.

Prapavessis, H. and McNair, P.J. (1999). Effects of instruction in jumping technique and experience jumping on ground reaction forces. The Journal of orthopaedic and sports *physical therapy,* 29(6), 352 – 556.

Prassas, S. and Gianikellis, K. (2002). Vaulting Mechanics. In *Applied Proceedings of the XX International Symposimu on Biomechanics in Sport – Gymnastics*. Caceres, Spain: University of Extremadura, Department of Sport Science.

Requejo, P.S., McNitt – Grey, J.L. and Flashner, H. (2002). Flight phase joint control required for successful gymnastics landings. *Medicine and Science in Sport and Exercise,* 34(5), Supplement 1, 99.

Requejo, P.S., McNitt – Grey, J.L. and Flashner, H. (2004). Modification of landing conditions at contact via flight. *Biological Cybernetics,* 90(5), 327 – 336.

Sabick, M. B., Goetz, R. K., Pfeiffer, R. P., Debeliso, M. and Shea, K.G. (2006). Symmetry in ground reaction forces during landing in gymnasts and non – gymnasts. *Medicine and Science in Sports and Exercise,* 38(5) Supplement: S23.

Self, B. P. and Paine, D. (2001). Ankle biomechanics during four landing techniques. Medicine and Science in Sport and Exercise, 33(8), 1338 – 1344.

Sell, T.C., Ferris, C.M., Abt, J.P., Tsai, Y.S., Myers, J.B., Fu, F.H. and Lephart, S.M. (2007). Predictors of proximal tibia anterior shear force during a vertical stop-jump. *J Orthop Res*, 25(2), 1589 – 1597.

Tant, C.L., Wilkerson, J.D. and Browder, K.D. (1989). Technique comparisons between hard and soft landings of young female gymnasts. In: Gregor RJ, Zernicke RF, Whiting WC, editors. *Proceedings of the XIIth International Congress of Biomechanics.* Los Angeles, CA: Pergamon Press.

Withrow, T.J., Huston, L.J., Wojtys, E.M. and Ashton – Miller, J.A. (2006). The effect of an impulsive knee valgus moment on in vitro relative ACL strain during a simulated jump landing. *Clin Biomech (Bristol, Avon)*, 21(9), 977 – 983.

Yeadon, M.R. (1999). "Learning how to twist fast." In Sanders, R. H. and Gibb, B. J. (Ed.) *Applied Proceedings of the XVII International Symposium on Biomechanics in Sports – Acrobatics* (p. 37 – 47). Perth, Western Australia: School of Biomedical and Sport Sciences, Edith Cowan University.

Zivcic Markovic, K. and Omrcen, D. (2009). The analysis of the influence of teaching methods on the acquisition of the landing phase in forward handspring. *Science of Gymnastics Journal,* 1(1), 21 - 30.

Slovenski izvlečki / Slovene Abstracts

Abie Grossfeld

RAZVOJ GIMNASTIKE V ZDRUŽENIH DRŽAVAH AMERIKE

Abie Grossfeld je opisal razvoj in dosežke gimnastične zveze Združenih držav Amerike. Navedeni so začetniki in organizacije, ki so sistematično razvijale gimnastični šport po vsej Ameriki. Pomembno so k razvoju prispevale naslednje organizacije: Turnverein, Sokoli, YMCA, športni klubi, srednje in visoke šole, prav tako pa tudi NCAA in AAU. Predstavljene so značilnosti preteklih in sedanjih disciplin športne gimnastike. Navedene so prvine, ki so jih prvi izvajali ameriški telovadci in telovadke ter seveda tisti, ki so bili najuspešnejši. Opisana je pot ameriških telovadcev in telovadk od olimpijskih iger leta 1904 do svetovnega prvenstva leta 2009. Narejen je seznam vseh ameriških nosilcev medalj na olimpijskih igrah, svetovnih prvenstvih, univerzijadah in vseameriških igrah.

Ključne besede: športna gimnastika, ZDA, zgodovina.

Mikko Pehkonen

KVALITETA POUČEVANJA KOT POGOJ USPEŠNOSTI UČENJA PRVIN GIMNASTIKE PRI ŠOLSKI ŠPORTNI VZGOJI.

Cilj raziskave je bil poiskati dejavnike, ki so pomembni pri učenju gimnastičnih prvin pri urah šolske športne vzgoje. Sto štirje 7- do 16- letni učenci iz 19 učnih skupin in 23 učiteljev je sodelovalo v triletnem poskusu. Uporabljeni so bili testi znanja in gibalnih sposobnosti. Video zapisi so bili uporabljeni za analizo učnega procesa. Pozornost raziskovanja je bila usmerjena v podajanje informacij, vadbo in povratne informacije. Faktorska analiza, regresijska analiza in samodejni iskalec povezav (AID) so bile uporabljene za analizo podatkov. Najpomembnejši dejavniki uspešnega procesa je kvaliteta vadbe. Rezultati so pokazali tudi, da je možno slabe povratne informacije nadomestiti s prenosom znanja (transfer učenja) in tudi obratno. Pristojnosti učitelja so značilno poudarjene s sposobnostjo upravljanja športne vzgoje in učenčeve samopodobe. Le-to zagotavlja obravnavo posameznikovih potreb in načrtnost poučevanja.

Ključne besede: športna gimnastika, športna vzgoja, prvine, učenje, kvaliteta.

Gammon M. Earhart, Callie Mosiman

PRIMERJAVA KOORDINACIJE HOJE V STOJI NA ROKAH S HOJO V STOJI NA NOGAH PRI TELOVADCIH

Hoja v stoji na rokah je dejavnost, ki jo mnogi, če ne večina ljudi nikoli ne uspe izvesti. Hoja v stoji na rokah pa je dejavnost, ki jo morajo telovadci in telovadke obvladati, če želijo biti uspešni. Razumevanje oblik uporabljenih za hojo v stoji na rokah lahko pojasnijo koordinacijo hoje v stoji na rokah in strategije, ki jih je mogoče uporabiti za izboljšanje te dejavnosti. Cilj raziskave je bil pojasniti prostorsko časovne parametre hoje v stoji na rokah, jih primerjati z hojo v stoji na nogah in kako je le-to odvisno od spretnosti merjencev. Devetnajst telovadcev je izvajalo hojo v stoji na rokah in nogah na računalniško upravljani preprogi. Merjenci so uporabljali skoraj identično strukturo hoje na rokah in nogah. Razlike so bile v krajših korakih na rokah, večji podporni površini rokah in dalj časa trajajočem opornem delu z rokami. Povečanje časa v opori na rokah je strategija, kjer želi merjenec povečati trdnostni kot, telovadčeva kvaliteta je bistveno vplivala na podaljševanje časa v opori na rokah. Trenerji pri vadbi naj bodo predvsem pozorni na povečevanje časa v opori na rokah.

Ključne besede: koordinacija, gimnastika, hoja, stoja na rokah.

George Dallas, Paschalis Kirialanis

SOJENJE IZVEDBE SESTAV V MOŠKI ŠPORTNI GIMNASTIKI

Pri sojenju v športni gimnastiki je delo razdeljeno na dve skupini sodnikov (D in E skupina). Običajno sodijo v D skupini bolje usposobljeni sodniki (mednarodni) kot v E skupini (nacionalni). Skupina E ocenjuje izvedbo, ki določa končna oceno. Cilj je bil ugotoviti ali se sodniki razlikujejo po usposobljenosti in pri ocenjevanju ter ali je ta razmejitev smiselna. Dvajset izkušenih sodnikov je prostovoljno sodelovalo in so bili glede na usposobljenost razdeljeni v dve skupini (mednarodni in nacionalni). Sodniki so ocenjevali devet sestav na krogih preko video posnetka in v skladu s pravili odbijali desetinke točk za izvedbo. Rezultati so pokazali, da obstajajo razlike v sodniških odločitvah glede na usposobljenost, zato bi bilo potrebno spremeniti sedanjo organiziranost sojenja v Grčiji.

Ključne besede: športna gimnastika, sojenje, ocenjevanje, nivo sojenja.

Miha Marinšek

OSNOVNE ZNAČILNOSTI DOSKOKA IN NJIHOVA UPORABA V GIMNASTIKI

Doskok je izjemno pomemben v gimnastiki, saj lahko poveča telovadčevo uspešnost in zmanjša verjetnost poškodovanja. Raziskave doskoka so zelo raznolike in z različnih vidikov pojasnjujejo doskok, največji del raziskav se je ukvarjal z biomehaničnimi značilnostmi doskokov in nadzorom gibanja pri doskoku. Njihovi rezultati so zato zelo zanimivi za prakso in z uporabo le-teh bodo lahko trenerji bolj učinkovito izvajali trenažni proces.

Ključne besede: gimnastika, doskok, kinematika, dinamika, nadzor gibanja.

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