

Limits to Performance - Women's NCAA Championships

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Many sports have justifiably toyed with the idea of limits to the continued growth and betterment of performance. Several sport scientists have studied the progress of various sports to determine the overall trend of the sport's development and to study the limits of human performance (4, 6, 11, 22, 24, 25, 27, 29, 36). In searching for a means of understanding the overall development of gymnastics, and insight into where the sport may be going in the near future, we undertook to determine the trends of performance in women's collegiate gymnastics. Because the NCAA maintains good records, the size and conduct of the competitions are relatively stable, and the increasing performance level of collegiate gymnasts has been obvious, these data were particularly attractive for study.

During the period from 1983 to 1998 women's collegiate gymnastics has experienced explosive growth in exposure, respect, and competitiveness. Figure 1 shows the top 10 team scores from the NCAA National Championships from 1983 to 1998. Note that the scores begin rather widely spaced, and as time continues, the spread of the scores becomes less and less. This trend supports a common perception among collegiate coaches that the NCAA National Championships have become much more competitive in recent years. This perception is largely based on the level of performance of the athletes and the sophistication and depth of the team performances. The data from the team scores of the NCAA Championships further support this perception.

The consequences of the narrowing variability of scores for the top ten teams at the NCAA Nationals has been a clear increase in the number of highly competitive teams, increased emphasis on reducing competitive errors, and a decreased likelihood of any particular team maintaining a dominance at the national championships. The net result of these factors has brought increased excitement, spectator base, and variety to the NCAA collegiate

program. **Figure 1** (right) shows that the scores received from the top teams at the championship competition are quite high and thus more likely to gain the respect and spectator base that has been apparent in recent years.

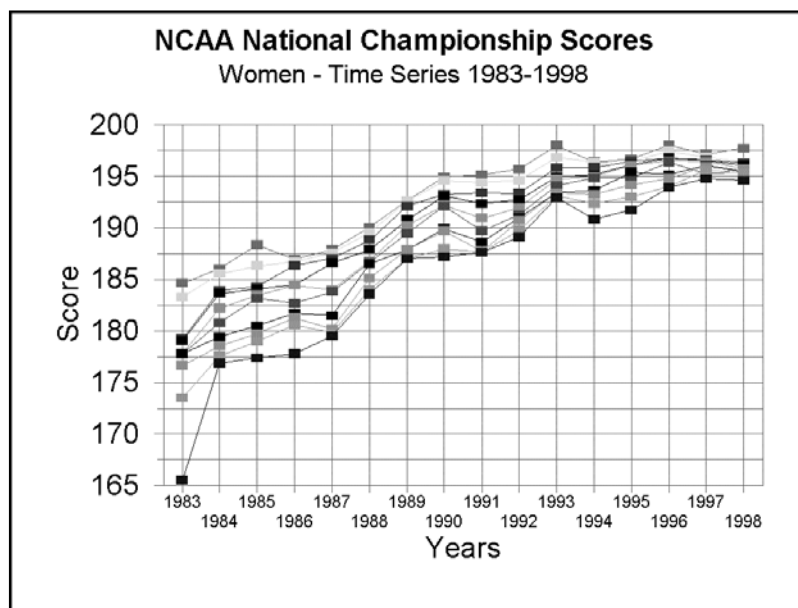
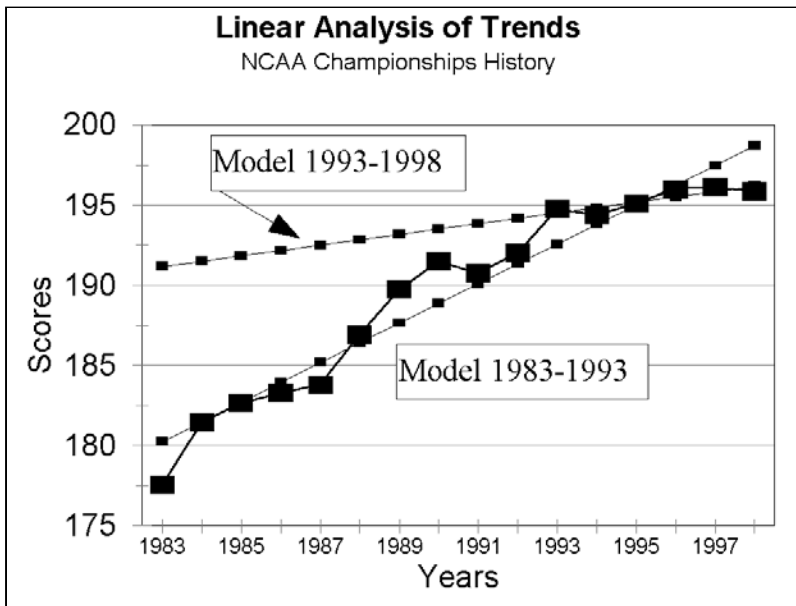


Figure 2 (below) shows a trends analysis via linear regression (20, 35). Note that the progress of the championship team scores during the period from 1983 to approximately 1993 was nearly linear. Then at approximately 1993, there occurred an inflection in the progress of scores. The linear model of the 1983-1993 scores does not appear to "fit" the progress of scores from 1993 to 1998. The inflection shown in score progress at approximately 1993 may be due to several factors. At the close of each quadrennium and Olympic Games, a newly structured *Code of Points* is invoked for the following quadrennium (19).



The new *Code of Points*, invoked in 1993, may have altered the approach to routine composition and performance which may have resulted in a pragmatic narrowing of scores. In other words, those skills and combinations that could be attained and maintained by the collegiate athlete may have become less broad. A new group of collegiate coaches may have taken the helms of collegiate programs and thereby changed the direction and competitive prowess of

teams on a team-by-team basis. After 1992, a particularly strong group of incoming gymnasts may have entered collegiate competition as a new group of freshman. Collegiate programs are limited in the number of full scholarships they can award. If there is a large group of available freshman in a particular class the number of athletes that must be spread among contending teams will necessarily increase and cause the larger group of talented athletes to be distributed among more schools resulting in more teams reaching the upper echelons of team rankings.

The overall results from this analysis show that women's collegiate gymnastics has experienced a rapidly increasing performance level up to approximately 1993. Following 1993 the rate of team score improvement has been more modest. Does this "leveling off" of scores indicate that gymnastics performance has reached a fundamental human performance limit? Surely there are limits to human performance, but analysis of gymnastics performance is more complex. Unlike track and field or swimming where a more objective measure is used (i.e., time or distance), in gymnastics the rules are somewhat of a moving target. As each quadrennium brings new rules, skill difficulty assessments, and so forth, the rules and the athlete's performances surely interact. Moreover, one cannot ignore that there is an imposed ceiling on scores. A perfect score for the team event is 200 points. **Figure 3** shows the percentage difference between first and tenth place. Note the progressively smaller score margins as time progresses.

Figure 3 (right) shows that the scoring margins decrease to under four

Team Score Range
Percentage Difference 1st-10th Place

percent from approximately

1988, and drop below two percent during 1997 and 1998. Such small scoring differences spread across 10 team ranks results in a diminishing margin of victory that places a premium on high performance with few or no errors.

The net result of the narrowing of scores may amount to several tactical issues. For example, as the scores narrow the competence of judges becomes more important. Judging mistakes and/or biases suddenly become serious and potentially devastating problems for teams who are vying for ranks that are a fraction of a percent apart (1, 3, 5, 7-10, 14-18, 21, 23, 28, 30, 34, 38-40, 42). Injuries to high performing gymnasts may be more devastating than in the past (13, 26, 31, 32, 37). The loss of a few tenths of a point due to the reduction of performer ability and score can now result in serious damage to a team score. The traditional "building" of scores that occurs in a team event due to the typical assignment of competitor order from weaker to stronger athletes places an increased emphasis on order-tactics (2, 12, 23, 33, 41). Finally, there may be an ever increasing emphasis on recruiting. As scores narrow at such a high value, the ability to take a relatively untrained and inexperienced athlete to these high scores will diminish. Of course, high scores are important, but consistency of scores may be more important. Because gymnastics elements are rated for their difficulty, it is important that coaches and athletes strike a balance between difficulty and consistency. A single fall counted in a team score is now potentially devastating. Of course, the closeness of scores makes the pressure on the gymnasts much more profound. Therefore, interventions by sport psychologists to help athletes deal with the pressure of competition may be particularly important when margins of victory are so small. Finally, it is important that gymnasts and coaches plan their preparation and competition tactics much more thoroughly. For example, jet-lag due to competitions at one of the coasts in the United States may be enough to alter a team's scoring potential and thus enhance or destroy their performance.

It is clear from the analysis of team scores that collegiate women's gymnastics may serve as an important touchstone for determining the overall progress of gymnastics. The stability of the championships, coaches, and rules makes the collegiate program particularly attractive to measure progress of many years. In the future, collegiate coaches may need to embrace sport science, particularly sport psychology much aggressively to ensure that a mental "pothole" does not derail their championship performances.

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