# SPECIFICITY OF SPORT TRAINING FOR THE ENHANCEMENT OF BASE RUNNING SPEED IN SOFTBALL PLAYERS

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## INTRODUCTION

To enhance running speed, a coach and/or athlete could design a conditioning program to manipulate physical and mechanical variables for decreased times. Chu and Korchemny (1990) stated that speed is a combination of stride length (SL) and stride frequency.(SF). Beasley, Tant, Miller and Jocson (in press) determined that the amount of weight lifted with 1 RM leg press (LPR) was highly related to flying 40 times (F40). Training programs have been found to be sport specific. By designing a lower body conditioning program, which incorporates strength training, plyometrics, form training, overspeed training and flexibility, the softball player should improve running speed. Increased improvement of SL or SF or the combination of increased SL and SF will increase speed of the base runner. Therefore, the purpose of this study was to determine if a variety of conditioning programs could enhance the speed of a base runner. Additionally, to determine if LPR would contribute to decreased F40 times as determined by Beasley, Tant, Miller and Jocson (in press).

## METHODS

Eleven Division II softball players (age: 20.5 $\pm$ .07; hgt: 167.8 cm $\pm$ 10.2; wgt: 73.3 kg $\pm$ 7.1) served as subjects. Subjects performed a pre-test consisting of strength and fitness variables, participated in a six week off-season conditioning program, and completed a post test of the same variables. Paired two sample t-tests were used to determine statistical significance between pre- and post test scores on the selected variables. Descriptive and fitness variables of age, weight, height, percent body fat (%BF), sit and reach (S&R), sit-ups (SUP), leg press (LPR), percent hamstring / quadricep strength ratio (%H/Q), stride length (SL), and flying 40 times (F40) were recorded during the testing sessions.

The off season conditioning program consisted of weight training, ballistics, plyometrics, sprint loading, and overspeed training. The weight training program was designed for both upper and lower body to improve strength and power. Station work with free weights and isotonic machines included squats, leg curls, leg extensions, trunk extensions, bench press, military press, lat pulls, and sit-ups. The ballistics program was developed to increase the explosiveness of initial movements and included medicine ball throws and vertical jumps with weights. The plyometrics program was designed to bridge the gap between strength and power. Activities included bounding, jumps, and hops on one and two legs. Sprint loading was sprinting against increasing resistance and included towing and resisting athletes forward progress with rubber tubing. The sport speed program was developed to improve sprinting form and speed endurance. Sprinting form activities involved butt kickers,

pawing, quick feet drills, start and sprint, and tubing for arm actions. Speed endurance included jogging, striding, sprinting, and walking specific distances and repititions. The overtraining program required the athlete to take faster steps than ever before. Subjects performed downhill running and high speed cycling on a bicycle ergometer.

**RESULTS**

The data of the pre-test scores (see Table 1) and the post test scores (see Table 2) indicated that differences occurred after a six week conditioning program. Because of limited number of subjects (one college team) and time constraints (between fall and spring seasons) having different groups participate in different programs was not possible. The data does indicate improvement on all variables tested, however which conditioning program contributed to the improvements cannot be stated.

Table 1. Descriptive data of pre-test scores

| | %BF | S&R (cm) | SUP (#/60s) | LPR (kg) | %H/Q | SL (cm) | F40 (sec) |
|---|---|---|---|---|---|---|---|
| M | 24.5 | 102.8 | 44.8 | 144.4 | 64.9 | 323.8 | 5.8 |
| SD | 5.2 | 13.4 | 6.7 | 24.9 | 13.9 | 31.8 | 0.4 |
| SEM | 1.3 | 2.2 | 1.8 | 7.5 | 4.2 | 9.6 | 0.1 |

Table 2. Descriptive data of post test scores

| | %BF | S&R (cm) | SUP (#/60s) | LPR (kg) | %H/Q | SL (cm) | F40 (sec) |
|---|---|---|---|---|---|---|---|
| M | 20.3 | 112.6 | 54.1 | 159.5 | 69.5 | 362.2 | 5.6 |
| SD | 4.3 | 10.8 | 7.0 | 21.7 | 7.7 | 13.4 | 0.4 |
| SEM | 0.9 | 2.0 | 1.4 | 6.5 | 2.3 | 4.0 | 0.1 |

The percentages of improvement between the pre- and post test scores for the selected variables were %BF (82%), S&R (91%), SUP (83%), LPR (91%), %H/Q (93%), SL (89%), and F40 (96%). The improvement percentages of the subjects were very high. The F40 times were much faster initially for the subjects in this study as compared to Miller, Tant, Jocson and Beasley (in press). However, the subjects did decrease the time with a 96% improvement after the off-season conditioning program.

Pearson correlation was used to determine if relationships existed between the dependent variable (F40 times) and the independent variables (%BF, S&R, SUP, LPR, %H/Q, SL). A t-test was performed to determine if significant differences existed between the pre- and post tests (see Table 3) on the variables identified with strong relationships.

Table 3. Correlation and t-values for selected variables

| | F40 | LPR | %H/Q | SL |
|---|---|---|---|---|
| Correlation | | 0.831 | 0.938 | 0.491 |
| t-value | 1.0636 | -3.751 | -2.097 | -4.544 |
| P: two-tail | 0.3125 | 0.004 | 0.049 | 0.001 |

($p \leq 0.05$; critical t = 2.228)

Strong relationships existed between the F40 times and LPR and %H/Q. The athletes improved in both categories and significant differences were found. This would suggest that a lower body conditioning program was effective at producing increased velocity of the base runner. The relationship between the F40 and SL was low, however a very significant t-value. All subjects increased SL, which one would expect to enhance speed as based on the proposed model by Miller, Tant, Jocson and Beasley (in press). With r = 0.491 other factors also seem to effect speed, however the lower body conditioning program did have have a significant impact on increasing SL. The F40 times did not indicate a significant difference, however times did decrease slightly. Because the subjects in this study were very fast initially, the ability of the subjects to increase speed would be at a maximum.

## CONCLUSIONS

Based on the results of the study, several different conditioning programs would increase an athletes velocity on the base paths. A limiting factor of this study was the confounding effects of several different programs and the lack of being able to determine which conditioning program contributed the most to the improvements seen. Future research should address the different programs to make a determination of the most effective program within time constraints of an athletic season. However, the application of a model proposed with theory (Miller, S., Tant, C.L., Jocson, M., & Beasley, L., in press), research conducted for obtaining facts (Beasley, L., Tant, C.L., Miller, S., & Jocson, M., in press), and practical use of the findings would assist the athlete and coach with the production of decreased times for sprinting speed. Additionally, the cooperation between the biomechanist and coach/athlete would fulfill the mission of the International Society of Biomechanics in Sports of "bridging the gap between research and practice".

## REFERENCES

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