The Effects of Body Size and Gender on Overarm Throwing Performance.

Researchers from the Norwegian University of Science and Technology in Trondheim, Norway recently examined the relationships between maximal isometric strength, anthropometry, and maximum overarm throwing velocity in 20 male and 20 female handball players. Research showed throwing velocity was higher in the male athletes (23.2 m/s) when compared to the female athletes (19.1 m/s). However, these differences were not statistically significant.

Overall isometric markers of strength were significantly correlated with throwing velocity (men: r=0.43; women: r=0.49). This suggests that overall strength plays a role in an athlete's ability to throw at higher velocities. Further examination revealed that isometric strength and throwing velocity were related to overall body size for both the male and female athletes—with larger athletes exhibiting greater isometric strength and throwing velocities.

When examining the throwing velocities by body mass or height for each gender, a significant difference existed between the male and female athletes: When velocity was expressed—related to fat free mass—the difference between genders was insignificant. The researchers concluded that overall size (or as they termed it "muscle bulk") and muscular strength explained part of the differences in throwing velocity seen between male and female handball players. This data strongly suggests that strength training, which increases muscular size and/or strength, plays a significant role in an athlete's ability to throw at high velocities and generate high measures on tests of isometric strength. Therefore, it would be beneficial for athletes looking to throw at high velocities to include some form of strength training in their programs.

Van den Tillaar R, Ettema G. (2004). Effect of body size and gender in overarm throwing performance. *European Journal of Applied Physiology, 91(4)*:413 – 418.

Does Listening to Music Improve Endurance Performance?

Many athletes believe that listening to music during exercise results in improvements in performance. However very little research has been conducted examining the ergogenic effects of music on actual sports performance.

Recently researchers from Loughborough University and Liverpool John Moores University examined the physiological and psychological effects of music on 10-km cycling time trial performance. A total of 16 endurance athletes who utilized cycling in their training were recruited for this study. Each subject performed two 10-km time trials, one of which required subjects to listen to music. The music selected was categorized as "trance" music, which was a form of dance music with a tempo of ~142 beats per minute.

The results of the study suggest that the utilization of music did contribute to a significantly higher mean speed (+2.6% km/h), mean power (+4.7% W), and mean heart rate (+4.2 beats/min) when compared to the time trial performed without music. Close inspection of the music time trial revealed that the subjects cycled faster during the first 3 km and last km of the time trial when compared to the condition that did not have music.

When looking at the subjects' rating of perceived exertion (RPE) during the time trials, it was determined that the music

condition elicited a significantly higher average RPE (+5.6%) when compared to the time trial performed without music. Further exploration into why the music was effective revealed that the music's "tempo" and "rhythm" were the most motivating components of the music.

In conclusion, it appears that using music can enhance performance through increasing the athlete's ability to maintain higher speeds, power output, and heart rates during 10-km time-trial performance. However, the athlete may have to pay particular attention to the initiation of the time trial, as a fast start may impair performance at the end of the race.

Based upon this research, it appears that dance music that has a fast "tempo" (and contains strong rhythms) may be the most beneficial type of music for the athlete to select.

Atkinson G, Wilson D, Eubank M. (2004). Effects of music on work-rate distribution during a cycling time trial. *International Journal of Sports Medicine, 25*:611 – 615.

How Does Getting Older Affect Weightlifting and Powerlifting Performance in Men and Women?

A recent study published by researchers from the University of Texas at Austin explored the effects of gender and age on weightlifting (snatch and clean & jerk) and powerlifting (deadlift, squat, and bench press) performance. Age group records were collected in various age categories from U.S weightlifting and Powerlifting Organizations. When examining the data, it was apparent that overall lifting performance, regardless of the type of lifting sport, decreased with advancing age (<40 to 69 years of age) regardless of gender. Also, it appeared that weightlifting performance demonstrated a significantly greater performance decrease with advancing age when compared to powerlifting—regardless of gender.

> **"strength training… plays a significant role in an athlete's ability to throw at high velocities…"**

The rate of weightlifting-performance decline seemed to be curvilinear with the most rapid decreases in performance occurring between the ages of 40 – 44 in both men and women. Additionally, it appeared that women experienced a greater overall magnitude of performance decline (-70%) in weightlifting as they age than men (-45%). However, the decline seen in women weightlifters may be a function of the fact that women's weightlifting is a relatively new sport.

When closely examining the performance decrements associated with aging during powerlifting, it was noted that performance decreased linearly with each five year increment from the age of 40 to 69 (-35% men; -55% women from 40 to 69) and that there were no significant differences between upper (bench press) and lower body exercises (squat). Additionally, the rate of decline in powerlifting performance was not significantly different between genders.

The researchers concluded that muscular strength and power do in fact decline with age. Additionally, they concluded that muscular power and exercises that require greater neuromuscular coordination (weightlifting) experience greater reductions in response to aging. Close examination of the present study suggests that weightlifting performance is much harder to maintain as weightlifters become older versus that of powerlifting performance.

Therefore, it is likely that master's weightlifters (>40 y) will experience rapid decrements (25 to 35%) between the ages of 40 – 44 in performance in response to aging—while powerlifters experience smaller decreases (10 – 15%).

Anton MM, Spirduso WW, Tanaka H. (2004). Age related declines in anaerobic muscular performance: weightlifting and powerlifting. *Medicine and Science in Sports and Exercise, 36(1)*:143 – 147. ▲

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