

WORK-ENERGY-POWER

Units 10 & 11 Dr. John P. Cise, Professor of Physics, Austin Com. College, Austin Tx. jpcise@austincc.edu & New York Times , November 22, 2017, by Richard Sandomir

Naim Suleymanoglu, 50, Dies; Weight Lifting's 'Pocket Hercules'



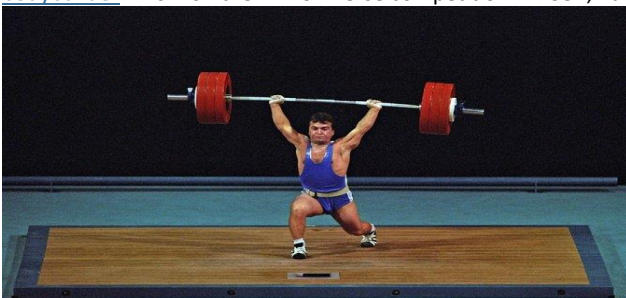
Naim Suleymanoglu in 1988 during a lift that **won him a gold medal in the 60-kilogram Olympic weightlifting** at the Summer Olympics in Seoul, South Korea.

Naim Suleymanoglu, a Turkish weight lifter whose diminutive size and stunning strength earned him the nickname Pocket Hercules on his way to winning three consecutive Olympic gold medals, died on Saturday in Istanbul. He was 50. Suleymanoglu, who stood about 4 feet 10 inches and competed as a featherweight, was internationally known by the time he competed at the 1988 Summer Olympics in Seoul, South Korea. In the snatch — in which competitors raise the barbell overhead in a single continuous motion — Suleymanoglu lifted 336 pounds on his third and final attempt. **(((Then, in the clean and jerk, which requires raising the barbell to the chest and then overhead, he set a new world record in his weight class by lifting 419 pounds)))**. At the 1996 Summer Olympics in Atlanta, Suleymanoglu and his closest rival, **Valerios Leonidis** of Greece, traded world-record lifts in an **epic competition of little men wielding big weights**. Their match came down to Leonidis's final lift. When he failed, Suleymanoglu became the first weight lifter to win gold medals in three successive Olympics. Suleymanoglu was not the only "Pocket Hercules." **Manohar Aich, a 4-foot-11 bodybuilder** who won the Mr. Universe competition in 1952, had the same nickname. He died last year, at 103.

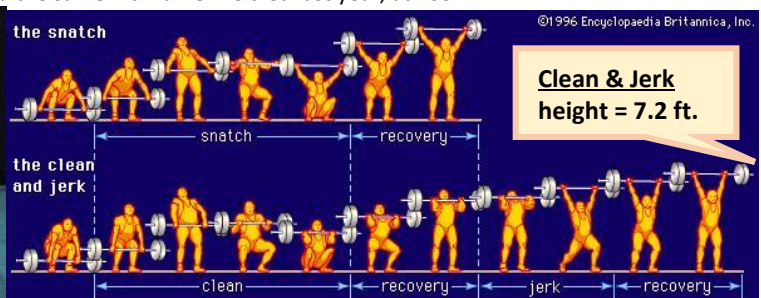
INTRODUCTION: Goal of this application is to verify time to clean & jerk (see definition of clean & jerk chart below). Time data in lower left table states $t_{\text{CLEAN}} + t_{\text{JERK}} = t_{\text{TOTAL}} = 0.76 \text{ s} + 1.0 \text{ s} = 1.76 \text{ s}$. In 60 kg. weightlifter class... both tables(bottom) show power generated by weightlifter averages ~ 2500 Watts. **Power = P = [work done]/time = [mgh]/t** . Work done in lifting goes into gravitational potential energy of weights (419 lb. here). Reasonable height lifted here = h = 7.2 feet.

QUESTION: Confirm this gold medal clean & jerk lift took about 1.76 s ? Find t = ?

HINTS: Do in MKS system. 4.448 N./lb. , 0.305 meters/ft. **ANSWER:** $t_{\text{TOTAL}} = 1.64 \text{ s}$. Table gold medal times to clean & jerk of 1.76 s is close to computed t = 1.64 s.



Suleymanoglu at the 1996 Summer Olympics in Atlanta, where he became 1st. weight lifter wining gold in three successive Olympics.



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culated from the maximum kinetic energy of the bar and additional time required to reach maximum elevation was

TABLE 1. Comparison of two methods used to calculate power output related to vertical bar movement.

| Power | Lifter's Bodyweight (kg) | | | | | |
|----------------|--------------------------|------|------|------|------|------|
| | 52 | 56 | 60 | 82.5 | 82.5 | 100 |
| KE(max) + PE | 845 | 956 | 1064 | 1545 | 1644 | DNA |
| Time to max KE | 0.92 | 0.80 | 0.84 | 0.84 | 0.84 | 0.68 |
| (g/m/s) | 920 | 1195 | 1266 | 1839 | 1719 | 2510 |
| PE(max) | 925 | 1067 | 1169 | 1646 | 1606 | DNA |
| Time to max PE | 1.15 | 1.04 | 1.08 | 1.04 | 1.08 | 0.92 |
| (g/m/s) | 797 | 1026 | 1082 | 1583 | 1487 | 1963 |
| KE(max) + PE | 869 | DNA | 973 | 1537 | 1624 | 1655 |
| Time to max KE | 0.84 | DNA | 0.76 | 0.88 | 0.64 | 0.68 |
| (g/m/s) | 1034 | DNA | 1280 | 1747 | 2537 | 2434 |
| PE(max) | 960 | DNA | 1108 | 1633 | 1736 | 1842 |
| Time to max PE | 1.08 | DNA | 1.00 | 1.08 | 0.84 | 0.88 |
| (g/m/s) | 889 | DNA | 1108 | 1512 | 2066 | 2030 |

DNA: Data not available

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DNA: Data not available

WEIGHTLIFTING

TABLE 2. Total power output for five phases of the olympic lifts (watts).

| Lifting Movement | Lifter's Bodyweight (kg) | | | | | |
|---------------------|--------------------------|------|------|------|------|------|
| | 52 | 56 | 60 | 82.5 | 82.5 | 100 |
| Snatch Pull | 1245 | 1560 | 1592 | 2298 | 2173 | DNA |
| Clean Pull | 1305 | DNA | 1583 | DNA | 2123 | 3205 |
| "Upper" Snatch Pull | 1853 | 2619 | 2858 | 3621 | 3634 | DNA |
| "Upper" Clean Pull | 2206 | DNA | 2463 | DNA | 3475 | 4267 |
| Jerk Drive | 2503 | 2140 | 2827 | DNA | 3385 | 4592 |

DNA: Data not available