

Research Review

At a glance

The aim of the study was to determine the effect of a 10-day hospitalization on older adults.

CHALLENGES

This particular field of study is challenging because it may be viewed as morally incorrect to ask someone to remain in bed knowing that it will be harmful. However, researchers wanted to understand the magnitude of the effect, especially on aging populations.

Key metrics

Hospitalization is among one of the many fears among older adults. Various forms of hospitalization occur from planned to unplanned, with falls making up the greatest percentage of hospitalizations.



13.2M

hospitalizations yearly

THE STUDY

The researchers recruited 12 total participants, aged 60-85, comprised of 50% male and 50% female. Researchers were intrigued on three main metrics, strength, power and cardiorespiratory fitness.



Strength



Power



Cardiorespiratory
Fitness

WHY?

In our world, we know, each and every time we see an ambulance pull into a neighborhood or to the main entrance of a senior living community there's a chance that someone is fighting for their life. Fortunately enough it does not always come to an end of life situation. However, it will most certainly lead to regression in more ways than one.

Measuring the magnitude of decline in this particular study was a challenge due to the fact that it requires researchers to ask participants to act in a way they know will surely cause harm.

With that said we believe it is super important to understand the magnitude. How much can change following an extended hospitalization? What sort of effects does that have on one's independence?

As we continue on we will discuss strength and power, two measures that we measure upon initial assessment and throughout continued service. From there we will also look VO_2 max, a measure associated with aerobic fitness.

WHAT IS VO_2 MAX?

The measure, VO_2 max shows how much oxygen your body absorbs and uses while active. This can be in the form of structured exercise, as well as, activities of daily living. The higher one's VO_2 max, the greater their overall fitness level and their health. Unfortunately, like strength, VO_2 max also decreases as we age, and does so at an exaggerated rate as we reach 70 years of age.

Along with strength, VO_2 max can be trained, and improved, no matter one's age. Dependent on one's goals as they age, various VO_2 max thresholds must be achieved in order to meet the demands of the specific activity. For example, women need a VO_2 max of 12 mL/kg/min to maintain their independence, while men need a level of 15 mL/kg/min.

MEASURING STRENGTH VIA FORCE AND POWER

In previous studies, strength was measured via loss of lean muscle tissue. However with this process one can only estimate the true amount of strength lost. The study mentioned here, and with our services, we can accurately measure two metrics of strength, force and power. Both are extremely important, but power tends to be the favorite when it comes to measuring one's functional ability.

Understanding the difference between the two is quite simple. Force can be seen as the absolute amount of strength a particular muscle has. Maximal force output is the greatest amount of force created by a muscle action, such as elbow flexion (bicep curl). Power on the other hand takes into account the speed at which the force is produced. Power is important because it not only tells us about the functional capacity, but also the communication that is occurring between the mind and the muscle. One who produces greater power output is likely to have greater neuromuscular connection because the brain can feed information to the muscle in a fast manner allowing for quick muscle contractions. This is especially useful when preventing falls.

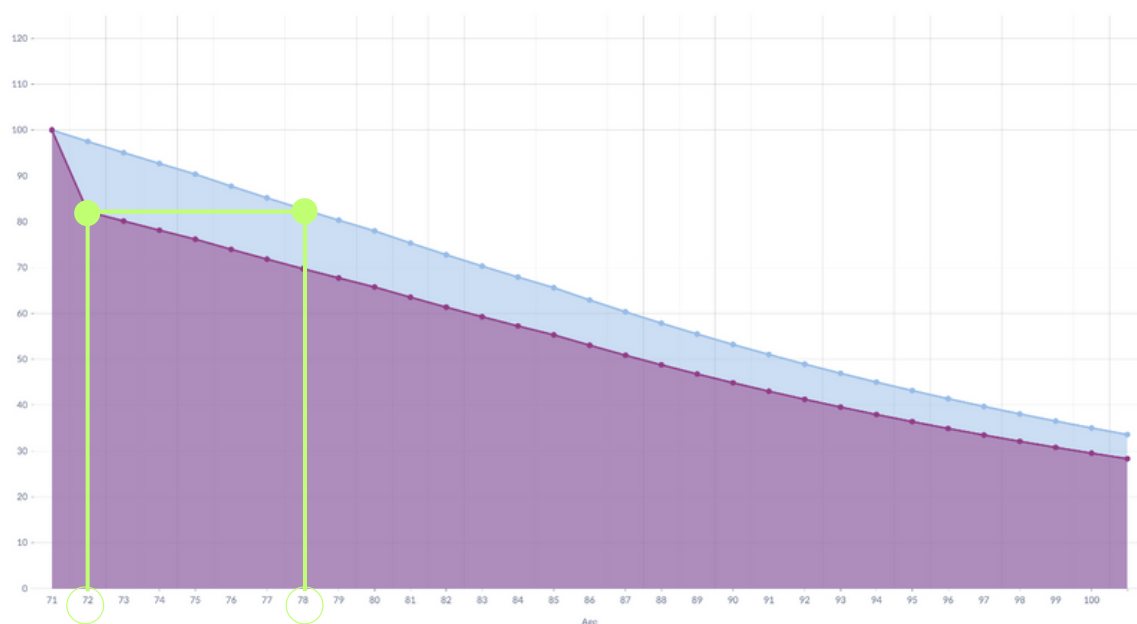
Picture this, someone is walking along and they stumble. One with high power output will be able to quickly generate force at the knee, ankle and hip to prevent a fall from happening. The braking mechanism completed by the lower body is done with high amounts of power thus preventing the fall. However, one with a lower power output may not have the ability to move quick enough for the 'catch' to occur. This person is more likely to fall.

Therefore when we look at strength, both factors, force and power are very key as both relate to one's functional capacity and fall risk.

STRENGTH (FORCE)

Most studies concern strength measure the amount of lean tissue lost over a given period of time. However, we can only infer how much true strength is lost when muscle or lean mass is measured opposed to strength itself. Fortunately, the design of this particularly study included a strength measure.

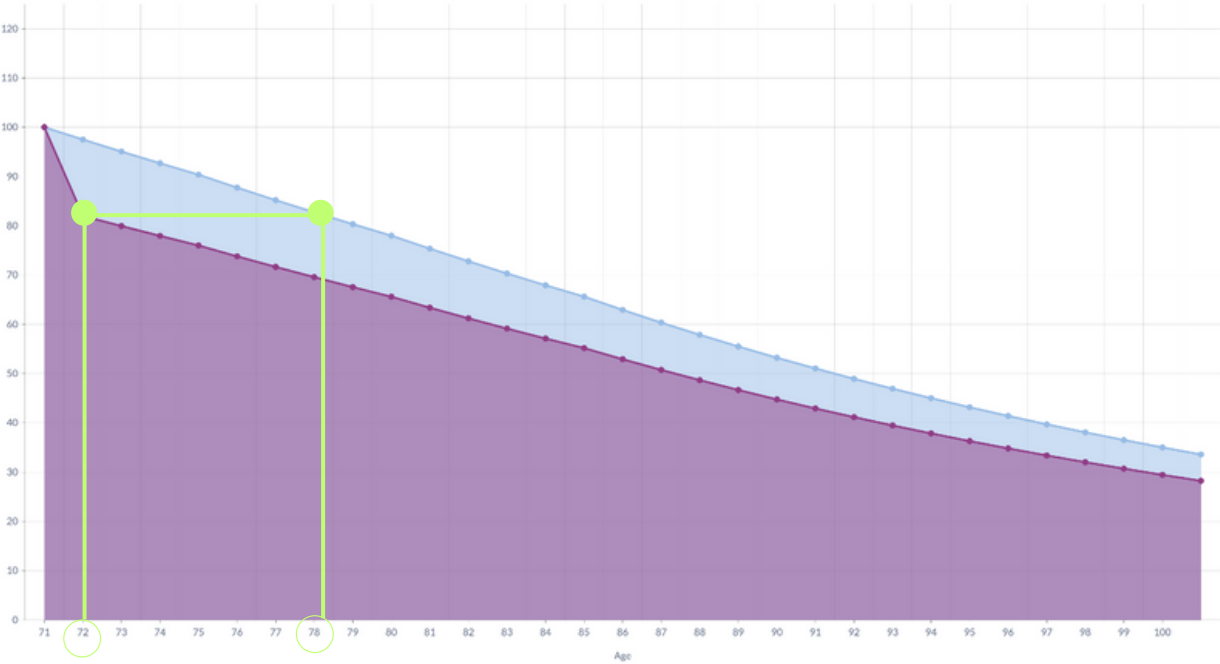
The participants saw a decline ranging from 7.2 to 17.8%. This came as quite a shock following our following of a particular study out of Copenhagen. The Copenhagen study noted those over the age of 70 saw a strength (force and power) loss of 3 to 4% **annually**. This loss was deemed 'normal' as it occurred in non-hospitalized individuals. This represents a 200-fold difference.



Knowing the 10-day hospitalization caused upwards of a 17% decline in strength, what does the 17% truly mean? The blue line shows the normal (3-4%) muscular strength loss according to the Copenhagen study. The purple line shows the drastic drop following 10-day hospitalization (17%). We can then compare the two points to show the hospitalization itself aged this individual (with regard to muscular strength) **six years**. When comparing what happened over ten days compared to six years, this represents a 200-fold acceleration.

STRENGTH (POWER)

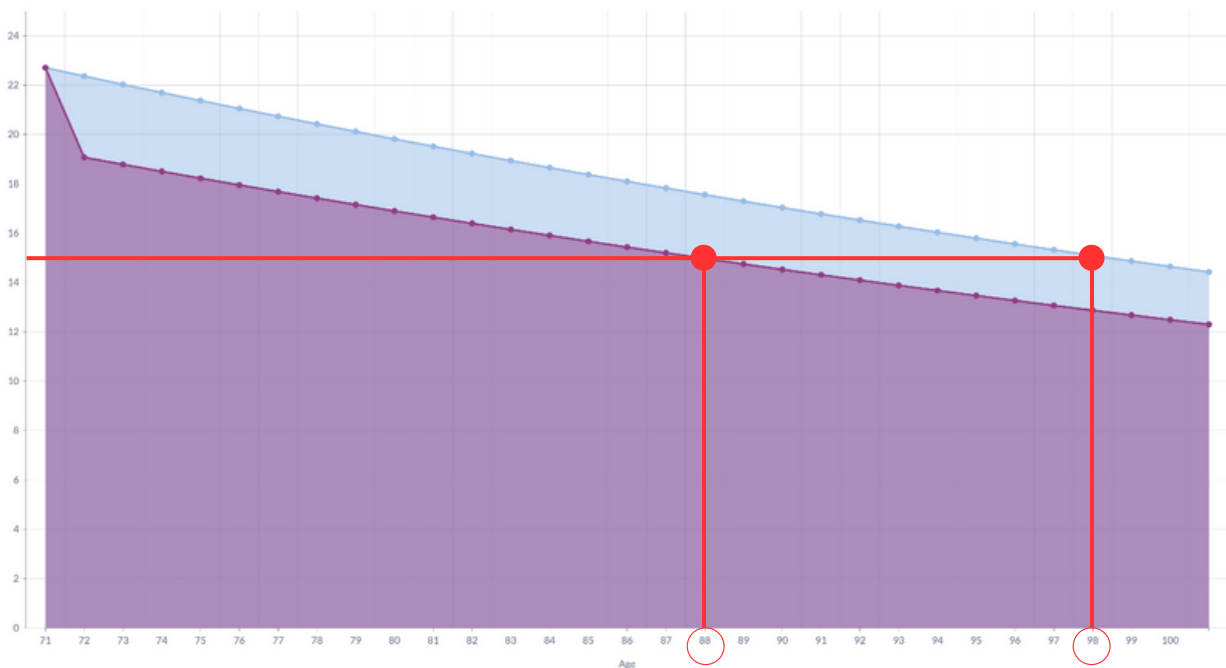
When viewing power, we see something quite similar. In this case, power was measured via a stair climb test. As mentioned above, power takes into account how quickly one generates force. The more power, the better. Participants saw a decline in power ranging from 10-18%.



The decline seen was upwards of 18%, therefore the graph is eerily similar to the strength decline seen on the previous page. Again, we see a 10-day hospitalization accelerating decline by upwards of six years.

AEROBIC CAPACITY (VO₂ MAX)

Participants saw a decline in VO₂ max upwards of 16%. The range fell between 8 and 16% for participants, who, by definition were already considered to be within the lower quartile. The fact that these individuals were already aerobically unfit may have accelerated the decline. In order to understand more, further studies would have to be conducted on more aerobically fit individuals.



The implications are astounding. One singular, 10-day hospitalization led to a **10-year acceleration** in VO₂ max decline. VO₂ max declines at a rate of 1.5% per year for individuals aged 50-70, therefore when a decline of 16% occurs that represents over 10 years of loss.

Based on previous research it is noted that a male would likely lose their functional independence at a 15 mL/kg/min VO₂ max score. The blue line depicts a normal decline for a male at the age of 71, while the purple shows the effect of the hospitalization. We see that the threshold in the hospitalized individual occurs at the age of 88, while the non-hospitalized individual does not lose their physical functioning until the age of 98, a 10-year difference.

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CONCLUSIONS



Strength

Strength declines at a rate of 7 to 15%, which accelerates muscle aging upwards of six years.



Power

Power declines at a rate of 9 to 17%, which accelerates muscle aging upwards of six years.







Cardiorespiratory
Fitness

Aerobic capacity declines at a rate of 8 to 16%, which accelerates ones functional capacity upwards of 10 years.

RECOMMENDATIONS

Falls are the most common reason for emergency room visit, which ultimately leads to a hospitalization, potentially an extended one that has been described above. With that said falls should be avoided at all costs in the form of:

-  improved physical fitness
-  reduced clutter including throw rugs & power cords
-  improved lighting for evening trips to the bathroom
-  medication management

WHAT TO DO IF YOU ARE HOSPITALIZED

- Find out if you are able to receive physical therapy, regardless of the length of your stay. Simply asking will help to guide the next steps.
- If you cannot receive physical therapy, or it is taking an extended amount of time to get the ball rolling, don't be afraid to give us a call. We are able, and have worked with many that have been hospitalized.
- If you cannot receive physical therapy, and can walk under your own strength, do so. It will help tremendously.
- If walking the halls is not an option, exercises within the hospital bed will help to reduce the atrophy occurring on a daily basis. Send us an email, we'll send one over to you.
- Add a protein supplement in the form of a shake or bar. It has been shown the recommended amount (0.8 grams per kilogram of body weight) is not adequate, especially in a state of bed rest.
- Understand the discharge process early. Discharge from a hospital may entail:
 - Transport to an inpatient rehabilitation hospital such as Encompass.
 - This entails multiple hours of physical, occupational and speech therapy daily. A stay may range from 7-14 days.
 - A temporary stay within a skilled nursing facility. We recommend Premier Place at Glenview, Oakton Place at the Arlington, and the Gardens at Terracina Grand.
 - Therapy will be provided daily. We have also worked alongside many therapy units within skilled nursing facilities to accelerate the recovery process.
 - Discharge home under home healthy physical therapy services.
 - Home health therapy will likely occur in the form of physical therapy twice weekly, and occupational therapy once weekly. This will be for a limited amount of time. Often times we work with those under home health therapy as an additional supplement.

Remember, as a patient, you are allowed to utilize additional private pay services such as private nursing, care management & oversight, and therapy services such as ours at LiveWell.