

# Effects of Citrulline alone or combined with exercise on muscle mass, muscle strength and physical performance among older adults: a systematic review

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## BACKGROUND:

An oral CIT supplementation increases muscle protein synthesis, skeletal muscle mass, muscle fiber size, lean mass, muscle strength and mobility but also decreases adipose tissue mass, particularly visceral depot in old malnourished rats<sup>1,2</sup>. However, studies assessing CIT supplementation on muscle function and mobility in older adults are very heterogeneous.

## OBJECTIVE:

To Establish the potential of Citrulline supplementation (CIT) combined or not with exercise on muscle function and physical performance in older adults via a systematic review of randomized controlled trials (RCTs).

## METHODS:

- The Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) statement has been followed.
- Medline (via Ovid), Cochrane central register for controlled trials (CENTRAL via Ovid) and Scopus databases Medline (via Ovid) have been searched.
- Studies selection and data extraction have been performed by two researchers independently.
- Methodological quality of each included studies was assessed using the Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) tool

## RESULTS:

Based on PRISMA guideline, one hundred three references have been identified. Among this number, **only 6 RCTs (250 participants) matched** the inclusion criteria and were included in the present systematic review.

The overall quality of studies was rather high.

Among the included studies, 5/6 reported beneficial effects of CIT on **muscle mass**.

Studies (4/6) reported that CIT changed **muscle strength** but CIT + exercise results in further improvements in **upper muscle strength**.

Finally, 3/6 studies reported beneficial CIT effect **on physical performance** and suggested that CIT + exercise displayed greater improvements in **walking speed** than exercise alone.

Figure 1: Flow chart

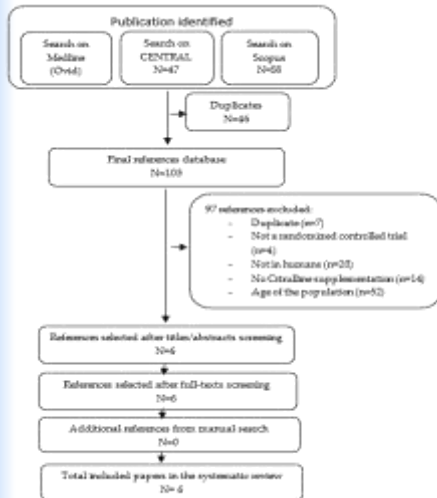


Table 1: Studies' characteristics

First author, (year, country)	General description	Population		Age (y)	Intervention	Control
		Sample size	Gender distribution		protocol	protocol
Devries, (2015, Canada)	Elderly men	INT: 10 CONT: 20	Men: 10 (100%) Men: 20 (100%)	70 ± 1	Step reduction (n/d: <1500) + 5 gr /day of CIT	Step reduction + 5g glycine/day
Buckinx, (2018, Canada)	Dynapenic-obese older adults	INT 26 CONT: 30	Men: 13 (50%) / women: 13 (50%) Men: 15 (50%) / women: 15 (50%)	65.2±4.2 68.1±4.1	HIIT (3*30 min/week) + CIT (10g / day)	HIIT (3*30 min /week) + PLA (maltodextrin)
Ashley, (2018, USA)	Older adults	Young adults: 15 Older adults: 11	Men: 7 (47%) / women: 8 (53%) Men: 4 (36%) / women: 7 (64%)	22 ± 2 74 ± 7	CIT (6 g / day) for 7 days + 2 week washout period	CIT (6g/day)
Bouillanne, (2019, France)	Malnourished older patients in rehabilitation units	INT: 11 CONT: 13	Men: 3 (27%) / women: 8 (73%) Men: 3 (23%) / women: 10 (77%)	89 (74-97) 88(77-92)	CIT (10g/day)	Equimolar mixture of 6 NEAAs
Buckinx, (2019, Canada)	obese older adults	INT 1: 21 INT 2: 19 CONT 1: 19 CONT 2: 14	Men: 8 (38%) / women: 13 (62%) Men: 7 (37%) / women: 12 (63%) Men: 9 (47%) / women: 10 (53%) Men: 9 (64%) / women: 5 (36%)	66.5±5.2 67.5±4.5 68.2±3.5 67.8±3.9	HIIT (3*30 min / week) +CIT (10g / day)	HIIT (3*30 min / week) + PLA (maltodextrin)
Figuroa, (2019, USA)	Obese postmenopausal women	INT 1: 14 INT 2: 13 CONT: 14	Women: 14 (100%) Women: 13 (100%) Women 14 (100%)	58±1	INT 1: CIT (6g/day) INT 2: WBVT (3 times / week) + CIT (6 g / day)	WBVT (3 times / week) + PLA (maltodextrin)

INT: intervention group, CONT: control group, CIT: citrulline, HIIT: high intensity interval training, WBVT: whole body vibration training

## CONCLUSION:

CIT supplementation seems able to improve muscular and physical factors in frail older adults (e.g malnourished, hypertensive, obese, dynapenic-obese) compared to placebo.

More importantly, CIT combined to exercise is more efficient than exercise or CIT alone.

However, due to the small number (6) and heterogeneity (dose, duration, population) of the studies realized in older adults, further studies are needed to confirm its promising potential

## Support:



## Références:

- Moinard, C., et al. J Nutr, 2015. 145(7): p. 1429-37.
- Joffin, N., et al. Biochim Open, 2015. 1: p. 1-5.