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# NETWORK ANALYSIS OF BIOMARKER AND MOLECULAR MECHANISMS FOR FRAILTY AND SARCOPENIA

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## INTRODUCTION

Physical frailty and sarcopenia are two increasing age-related health problems worldwide, which can lead to such adverse health outcomes as falls hospitalisation and death[1,2]. The molecular mechanisms of physical frailty and sarcopenia involve an interaction between multiple biomarkers in different signalling pathways[3]. However, it is sometimes difficult to assess which biomarkers are related to specific molecular mechanisms of action in these geriatric syndromes.

## METHODS

Data of publications (from 1997 to 2023) related to biomarkers and molecular mechanisms of physical frailty and sarcopenia were obtained from the database of Web of Science, Scopus, and PubMed. The following search query: TITLE-ABS-KEY = ((physical frailty OR sarcopenia) AND (biomarkers) AND (molecular mechanism)) was used to search and identify relevant articles. We refined the search to only research articles (original articles, reviews, and proceedings papers) and excluded other types of documents from our analysis. Microsoft Office Excel 2016 was used to stratify and systematically assess the sorted publications and data. The files containing data on the topic were imported into the visualization of similarities (VOS) viewer software (version 1.6.18) to perform bibliometric analysis and data visualization. We calculated the total link strength of a node, which is the sum of the link strengths of this node over all the other nodes. We used an open source software platform Cytoscape v.3.9 for visualizing networks.



**Fig. 1.** Cluster 1 (red) indicates bioentity. Cluster 2 (green) represents the physiological process. Cluster 3 (blue) involved resources.

## REFERENCES

1. Apóstolo et al. JBI Evidence Synthesis. 2017.
2. Oliveira et al. Journal of Physical Activity and Health. 2020.
3. Wilson et al. Ageing Research Reviews. 2017.

## OBJECTIVE

The aim of this study was to create a network analysis of molecular mechanisms and identify biomarkers for sarcopenia and frailty.

## RESULTS

A total of 38 articles were obtained to be used in keyword analysis. The keywords were divided into 3 clusters: I. represent biological molecules such as "creatinine", "cytokines", "citrulline", "interleukin"; II. represent physiological process and molecular mechanisms such as "inflammation", "metabolism", "oxidative stress", "muscle atrophy", "protein expression", "protein degradation"; III. indicates the research methods, strategy and subjects. It was found that the top three keywords with the most occurrences were "inflammation", "metabolism", and "cytokines". Interactions between all tree clusters are shown in Figure 1. Table 1 represents connection (expressed as total link strength) between biomarkers and molecular mechanisms.

Table 1. Connected biomarker and molecular mechanism keywords of sarcopenia and physical frailty

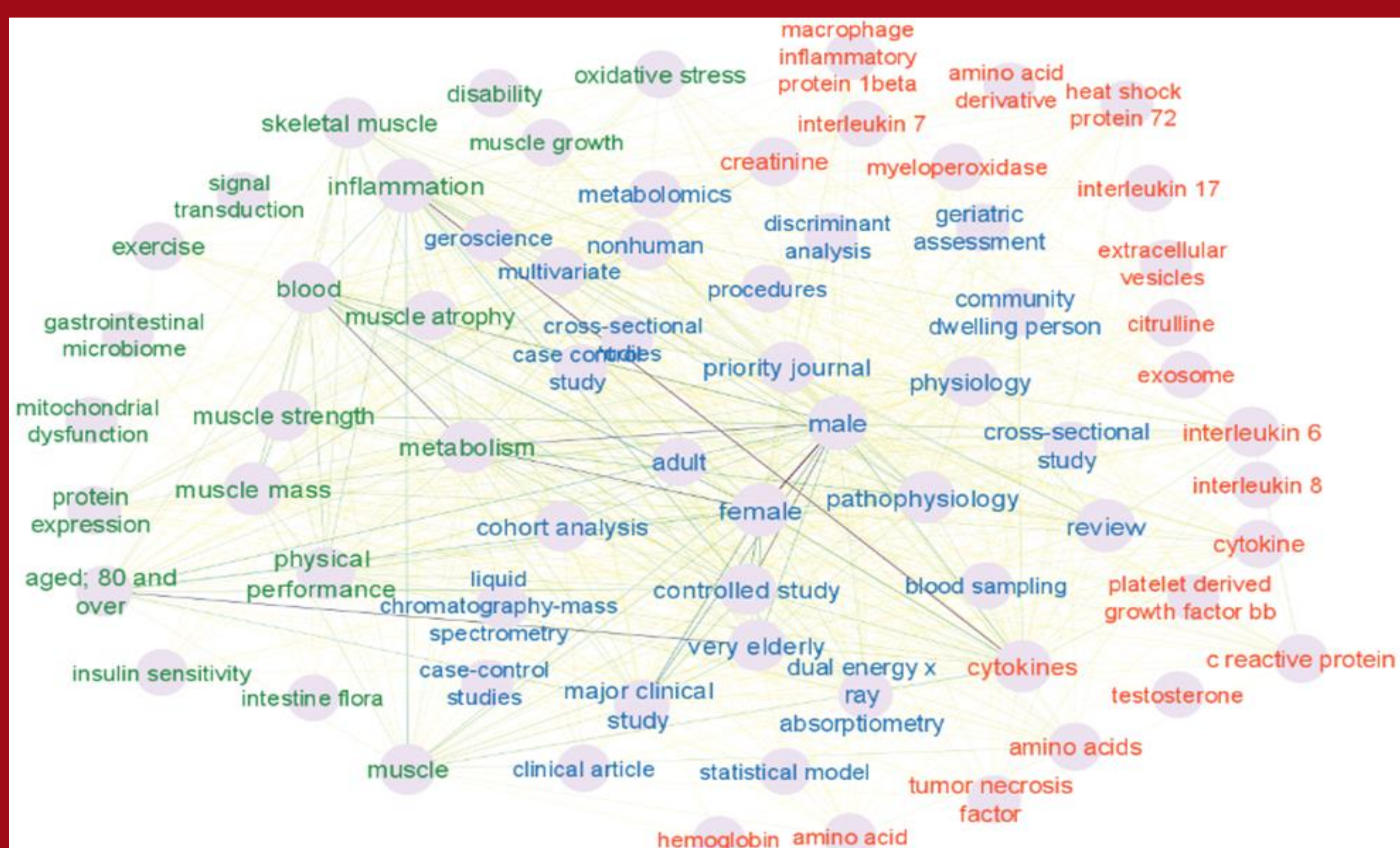| CLUSTER 1 (Biomarkers) | Total link strength | CLUSTER 2 (physiological processes) |
|---|---|---|
| Cytokines | 470 | Mitochondrial dysfunction, muscle atrophy, inflammation, oxidative stress, metabolism, insulin sensitivity, protein expression, protein degradation, physical performance |
| Interleukin 6 | 356 | Inflammation, oxidative stress, insulin sensitivity, metabolism, skeletal muscle, muscle atrophy, muscle strength, grip strength, muscle mass, body composition, protein expression, protein degradation, physical performance, aging |
| C reactive protein | 259 | Metabolism, inflammation, skeletal muscle, proteomics, protein expression, protein degradation, physical performance, oxidative stress, muscle strength, muscle atrophy |
| Creatinine | 249 | Skeletal muscle, muscle mass, muscle strength, metabolism, inflammation, oxidative stress |
| Tumor necrosis factor | 203 | Inflammation, muscle atrophy, physical performance, muscle strength |
| Amino acids | 185 | Metabolism, inflammation, muscle mass, physical performance |
| Citrulline | 150 | Metabolism, inflammation, muscle strength, muscle mass, physical performance |
| Myeloperoxidase | 148 | Inflammation, physical performance |
| Heat shock protein 72 | 139 | Muscle atrophy, muscle growth, inflammation, metabolism, pathophysiology |

## CONCLUSION

It was found that current research on frailty and sarcopenia focuses on biomarkers such as cytokines, which are related to molecular mechanisms of aging. Recently, the trend of sarcopenia and frailty research is changing from finding molecular mechanisms to examining biomarkers (cytokines) of inflammation, metabolic and muscle atrophy processes.

## DISCLOSURE

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