

# Does an Inflammatory Diet Worsen Multiple Sclerosis Symptoms?

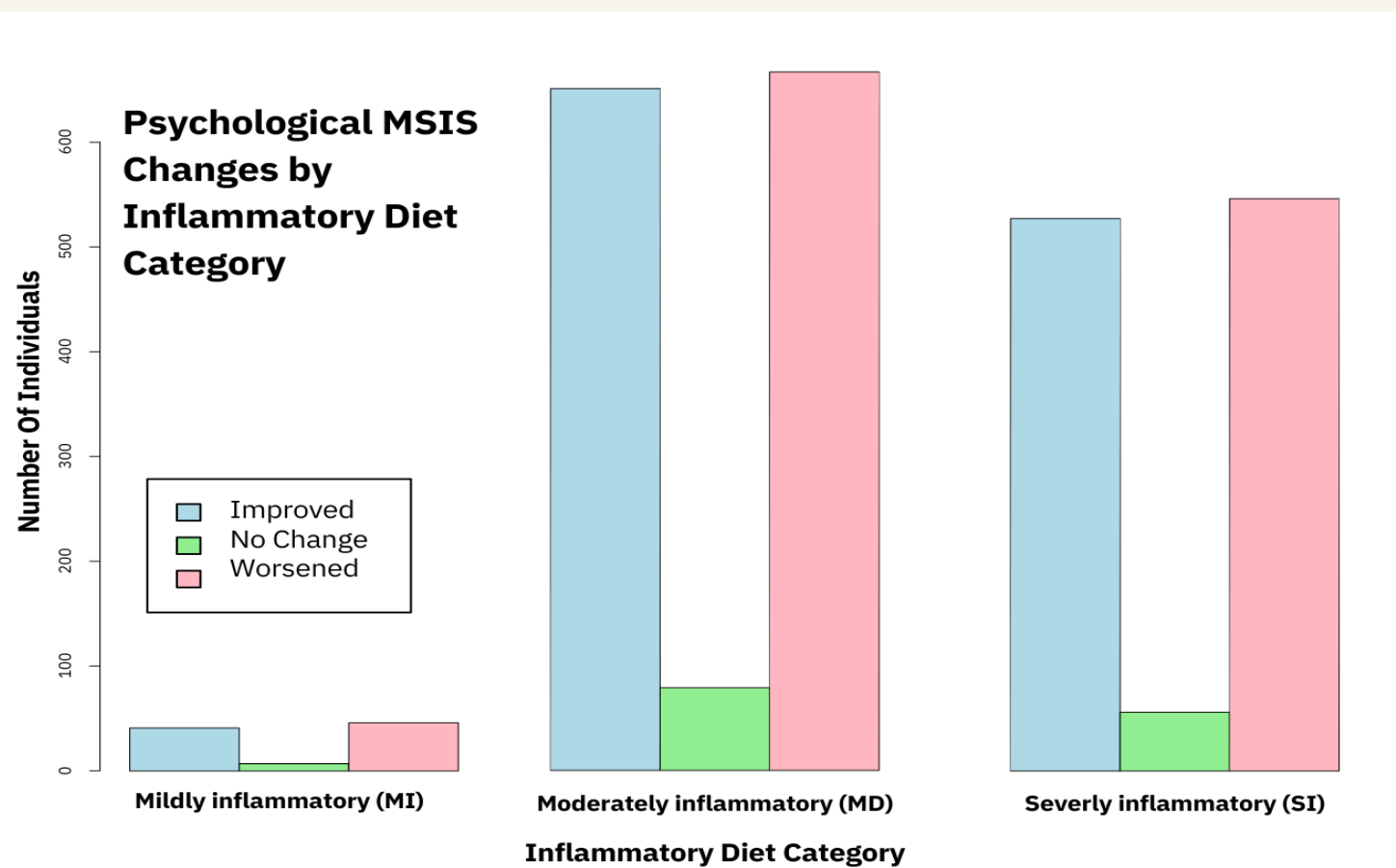


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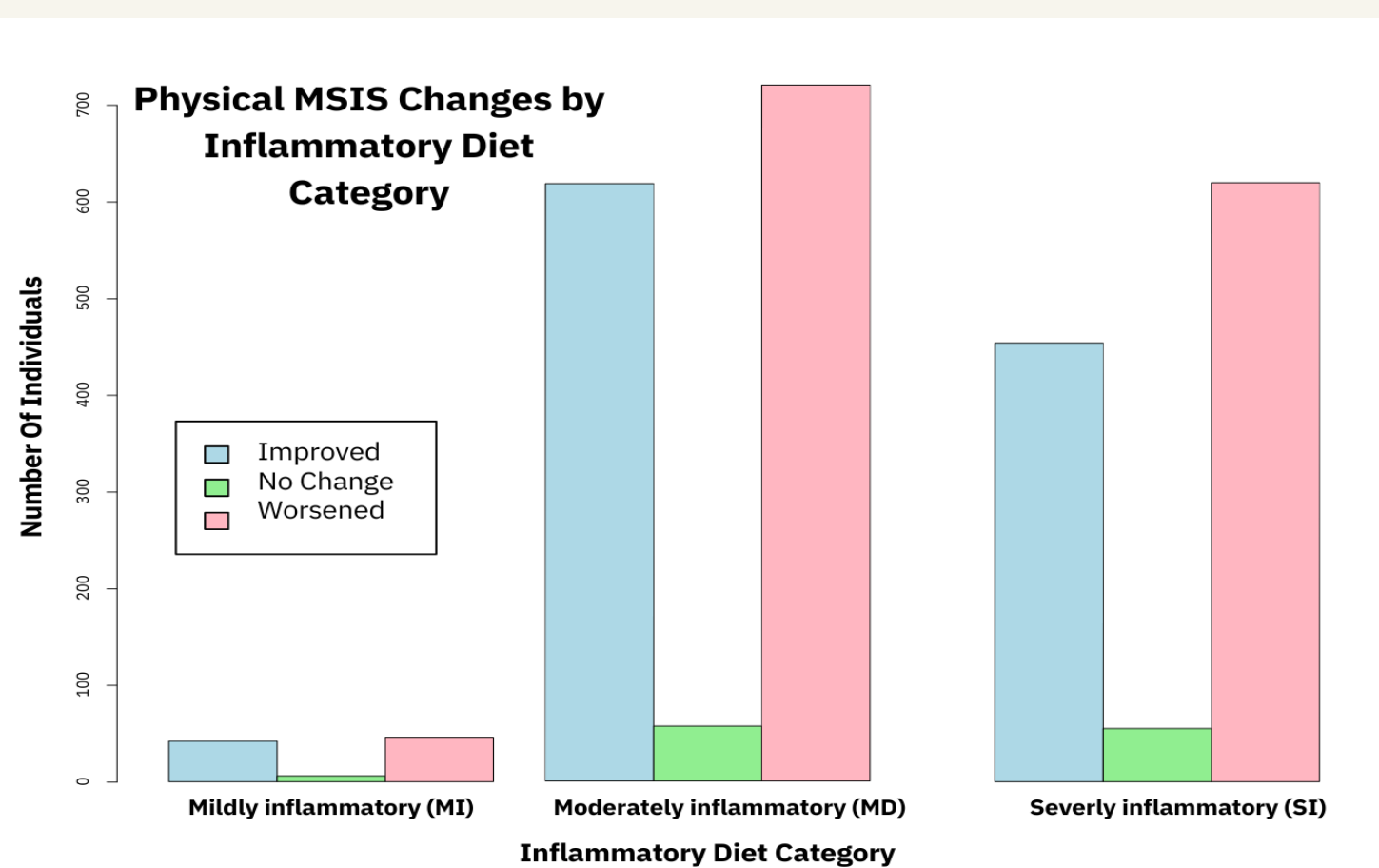
## 1.0 Introduction

- In recent years, Westernized diets have fueled the frequent consumption of ultra-processed foods entailing toxic additives, synthetic sweeteners & fats (1).
- This dietary shift is adverse to human health, driving gut dysbiosis, reduced microbiome diversity, and chronic low-grade inflammation, collaboratively inducing a range of diseases (1).
- Multiple Sclerosis (MS) is a chronic inflammatory, autoimmune disease that attacks the myelin, the protective coat of neurons, manifesting recurring episodes of debilitating cognitive & motor impairments (2)(3). MS is classified into four types, each outlined in the heading of Table 1 (2)(3).
- With the cause of MS still being unknown, grasping the impact of diet on MS is crucial, given its profound negative influence on microbiome health via inflammatory foods (1).
- Study Aim:** This study aims to assess how diets, classified by their inflammatory potential, impact the MSIS\*, a patient-reported measure of MS's physical & psychological effects (4), using FFQ, food frequency questionnaire, data from MS Register UK (5).

A)



B)



- Figure A:** From 2022 to 2024, a slightly higher percentage of participants (3-4%), across all diet categories, experienced worsened psychological symptoms when compared to those who improved.
- Figure B:** Comparatively, individuals with SI & MD inflammatory diets noticeably experienced greater physical symptom worsening, relative to the improved group. Herewith, suggesting a plausible link between SI, MD diet & the worsening of physical MSIS.

## 5.0 References & Acronyms

- Ross et al., 2024. DOI: 10.1038/s41579-024-01068-4
- Filippi et al., 2018. DOI:10.1038/s41572-018-0041-4.
- D'Anca et al., 2023. DOI: 10.3390/app13105881
- Hobart, 2001. DOI: 10.1093/brain/124.5.962
- Middleton et al., 2018. DOI: 10.1016/j.msard.2018.05.015.
- Link to MS Register UK: <https://ukmsregister.org/>

**MS Types \*\*\*\*:**  
 Benign/Benign  
 PPMS/ Primary/Progressive  
 RRMS/Relapsing-remitting  
 SPMS/ Secondary Progressive

**MSIS\*:**  
 Multiple Sclerosis  
 Impact Scale

## 2.0 Method

- Data preparation & cleaning:** FFQs, their demographics & MSIS datasets, obtained from 2016/18 & 2022/24, were cleaned and prepared for analysis.
- Data Handling Tools:** R Studio in SeRP from MS Register UK (4), was used for data handling processes.
- Demographic Analysis:** Demographic profiles of FFQ participants and their corresponding MSIS inputs were outlined (**Table 1 & 2**).
- Diet Classification:** FFQ subjects' diet were classified as mildly (**MI**), moderately (**MD**) & severely inflammatory (**SI**) using predetermined-criteria.
- MSIS Score Analysis:** The progression of users' MSIS scores from 2022 - 2024 & 2016 - 2018 were calculated & evaluated referencing their diet categories. (**Figure 1A & B, from 2022-2024 are shown**)

## 3.0 Key Results

| TABLE 1                     | Benign *           | PPMS *              | RRMS *               | SPMS *               |
|-----------------------------|--------------------|---------------------|----------------------|----------------------|
| n                           | 176                | 907                 | 3262                 | 1561                 |
| OnsetAGE (mean (SD))        | 34.55 (10.59)      | 45.66 (10.47)       | 35.05 (9.99)         | 33.81 (10.48)        |
| DiagnosisAge (mean (SD))    | 38.26 (11.50)      | 48.86 (10.17)       | 37.71 (10.11)        | 38.21 (11.18)        |
| TimetoDiagnosis (mean (SD)) | 3.56 (7.36)        | 2.74 (5.28)         | 2.49 (4.91)          | 4.14 (7.35)          |
| Gender Female/Male (%)      | 132/42 (75.9/24.1) | 484/417 (53.7/46.3) | 2612/631 (80.5/19.5) | 1146/399 (74.2/25.8) |

- Table 1:** Females, particularly with RRMS (80.5%), significantly outnumber males in MS, consistent with prior observations (3) and highlighting the need to investigate immunological factors driving this gender disparity in MS susceptibility.

| TABLE 2                       | Mildly inflammatory | Moderately inflammatory | Severely inflammatory |
|-------------------------------|---------------------|-------------------------|-----------------------|
| n                             | 130                 | 1806                    | 1501                  |
| Physical_MSIS (mean(SD))      | 45.52 (28.93)       | 44.40 (26.76)           | 42.05 (25.75)         |
| Psychological_MSIS (mean(SD)) | 38.86 (26.71)       | 37.70 (23.22)           | 38.84 (22.43)         |
| Gender Female/Male (%)        | 103/24 (81.1/18.9)  | 1403/392 (78.2/21.8)    | 1136/362 (75.8/24.2)  |

- Table 2:** Despite a female majority, both genders exhibit greater consumption of MD & SI diets. Additionally, mean MSIS scores, both physical & psychological, appear moderate, though notably, these do not capture the variability of MS' symptom manifestation.

## 4.0 Conclusion & Future Focus

- Prevalence & Diet Impact:** Inflammatory diets ((MD),(SI)) are common among MS patients (see Table 2). However, their direct overall impact on MSIS progression remains ambiguous, as only minor differences in psychological worsening compared to improved MSIS scores across all diet categories were observed (see Fig. A). Although a greater negative impact of MD & SI diets on physical MSIS was identified (see Fig. B) conclusions are provisional due to the outlined study limitations below.
- Study Limitations:** Results may be affected by potential inaccuracies in diet classification, missing data on dietary changes between 2016-2024 & factors, like smoking, influencing MSIS scores as these were not controlled in this study.
- Future Focus:** Addressing these limitations is critical to accurately discerning the relationship between diet and MSIS progression.