



Effects of omega-3 fatty acid supplementation on whole blood fatty acid levels



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INTRODUCTION: Omega-3 polyunsaturated fatty acids (n-3 PUFA) are popular dietary supplements that have purported beneficial effects for cardiovascular health¹, inflammatory², autoimmune², and mood disorders^{3, 4}. The manufacture of dietary supplements in the United States is not well regulated and concerns surrounding the content and purity of commercially available n-3 PUFA supplements is warranted, as false content labeling and harmful or oxidized fatty acid contaminants may lead to negative health outcomes⁵. In this research, which was part of a larger study assessing the role of nutritional and genetic factors in a sample of chronic musculoskeletal (MSK) pain sufferers, we report differences in whole blood fatty acid levels in a population seeking complementary and integrative health (CIH) care at an urban university-affiliated clinic. **METHODS:** A total of 99 eligible participants were recruited from the University of Bridgeport (UB) Clinics. We assessed participant demographics and medical histories, administered a validated food frequency questionnaire assessing n-3 PUFA dietary and supplement intake⁴, and measured whole blood fatty acids using dried blood spot (DBS) technology⁶.

Participant Characteristics

Table 1 – Participant Characteristics by n-3 Fatty Acid Supplement Status				
	Supplement Non-Users	Supplement Users	Statistic	p
Supplement Status, n (%)	59 (59.60)	40 (40.40)		
Sex, n (%)			Fisher's exact	>0.9999
Female	36 (62.07)	25 (62.50)		
Male	22 (37.93)	15 (37.50)		
Did not Respond	1	0		
Age, years, mean (SEM)	52.08 (3.225)	47.15 (2.479)	t(97)=1.226	0.2231
Race/Ethnicity, n (%)			Fisher's exact	0.1442
Caucasian/White	40 (71.43)	34 (85.00)		
Other/Non-White	16 (28.57)	6 (15.00)		
Did not Respond	3	0		

Table 1: No statistically significant differences in supplement status with age, sex, or race were noted.

n-3 PUFA supplement users had higher blood levels of n-3 fatty acids, and lower levels of n-6 fatty acids

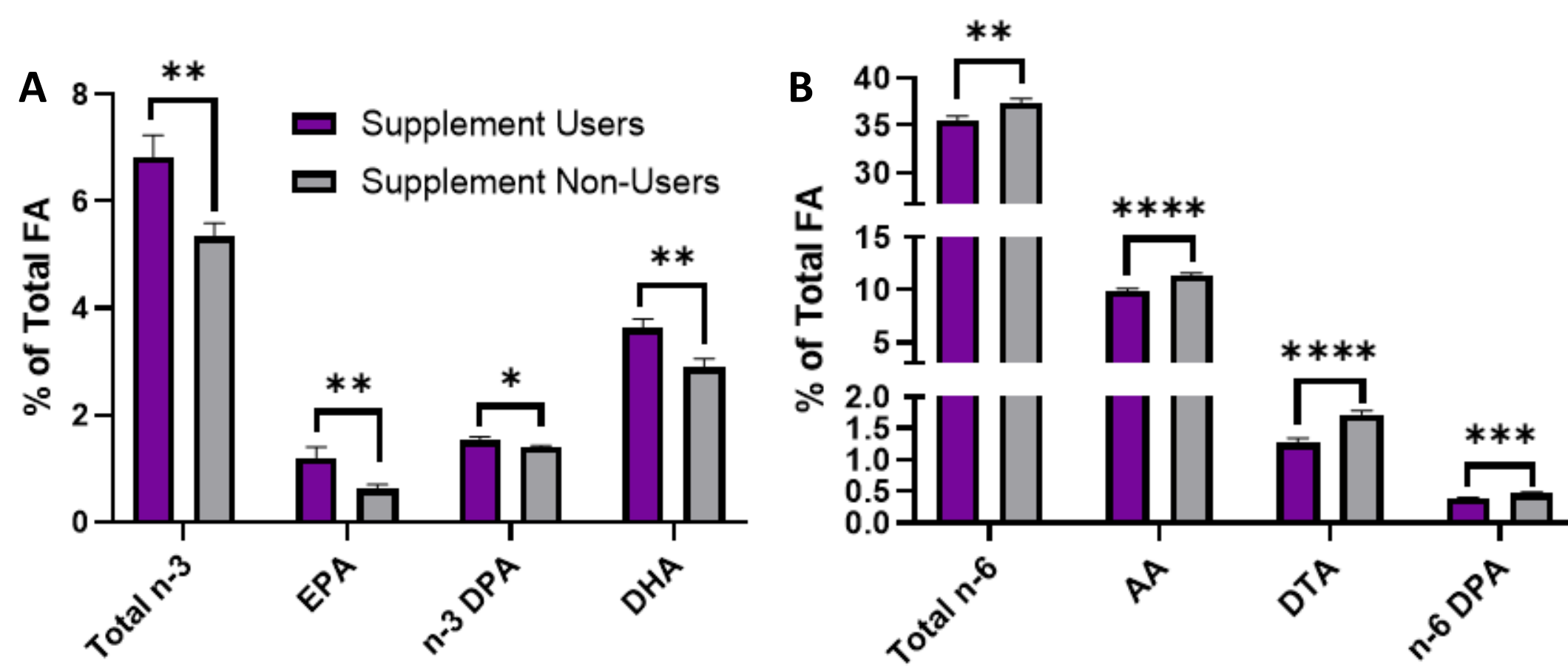


Fig. 1: A) Unpaired t-tests showed statistically significant increases in total n-3 fatty acids ($p=0.0014$), EPA ($p=0.0032$), n-3 DPA ($p=0.0476$), and DHA ($p=0.0039$) in the omega-3 supplement users compared to non-users. B) Unpaired t-tests showed statistically significant decreases in total n-6 fatty acids ($p=0.0045$), AA ($p<0.0001$), DTA ($p<0.0001$), and n-6 DPA ($p=0.0006$) in the omega-3 supplement users compared to non-users.

Dietary intake of n-3 fatty acids from foods did not differ

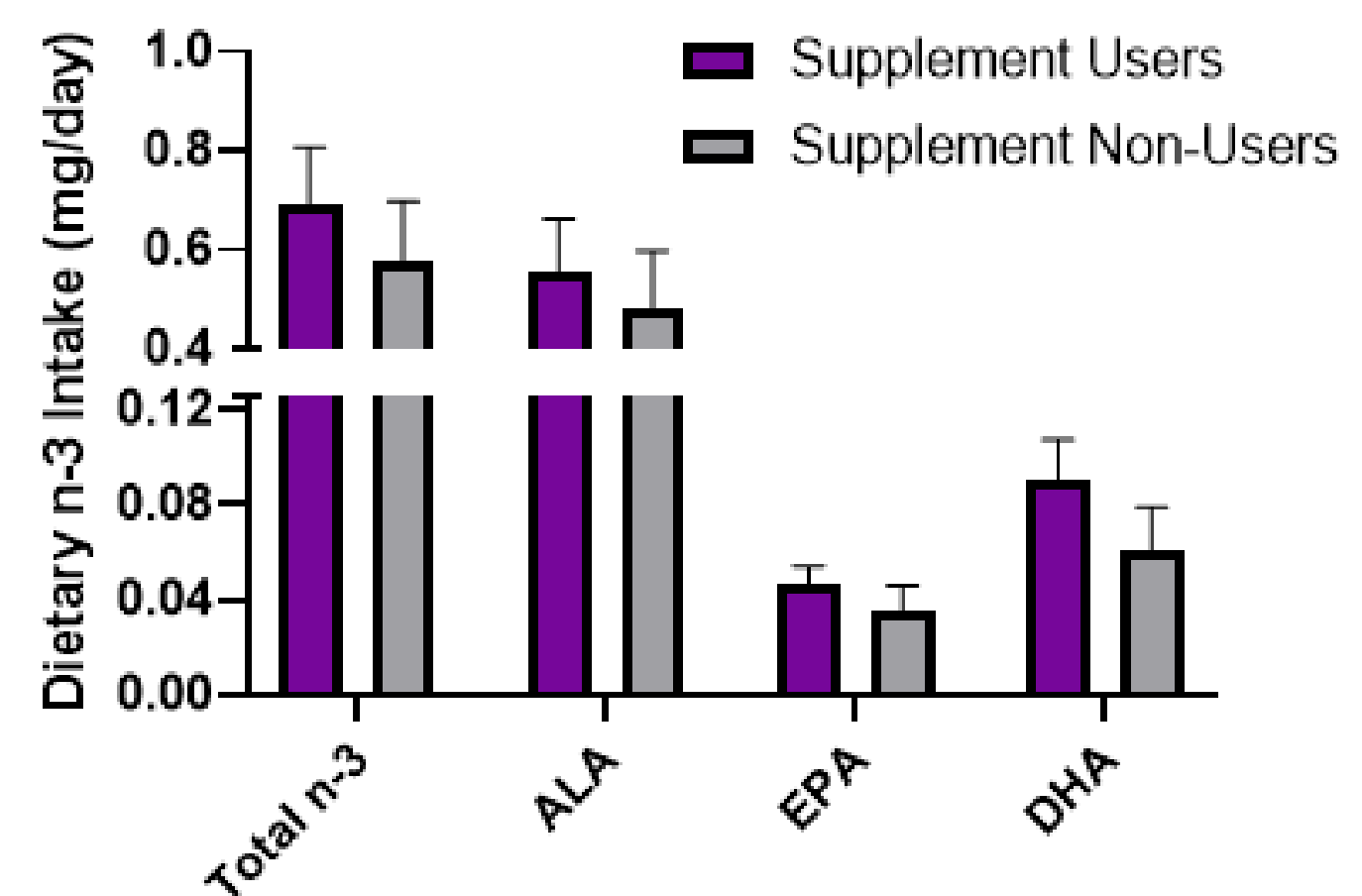


Fig. 2: Unpaired t-tests showed no statistically significant difference in the dietary intake of total n-3 fatty acids, ALA, EPA or n-3 DPA in the omega-3 supplement users compared to non-users.

n-3 PUFA supplement users had higher blood levels of saturated and trans-fatty acids

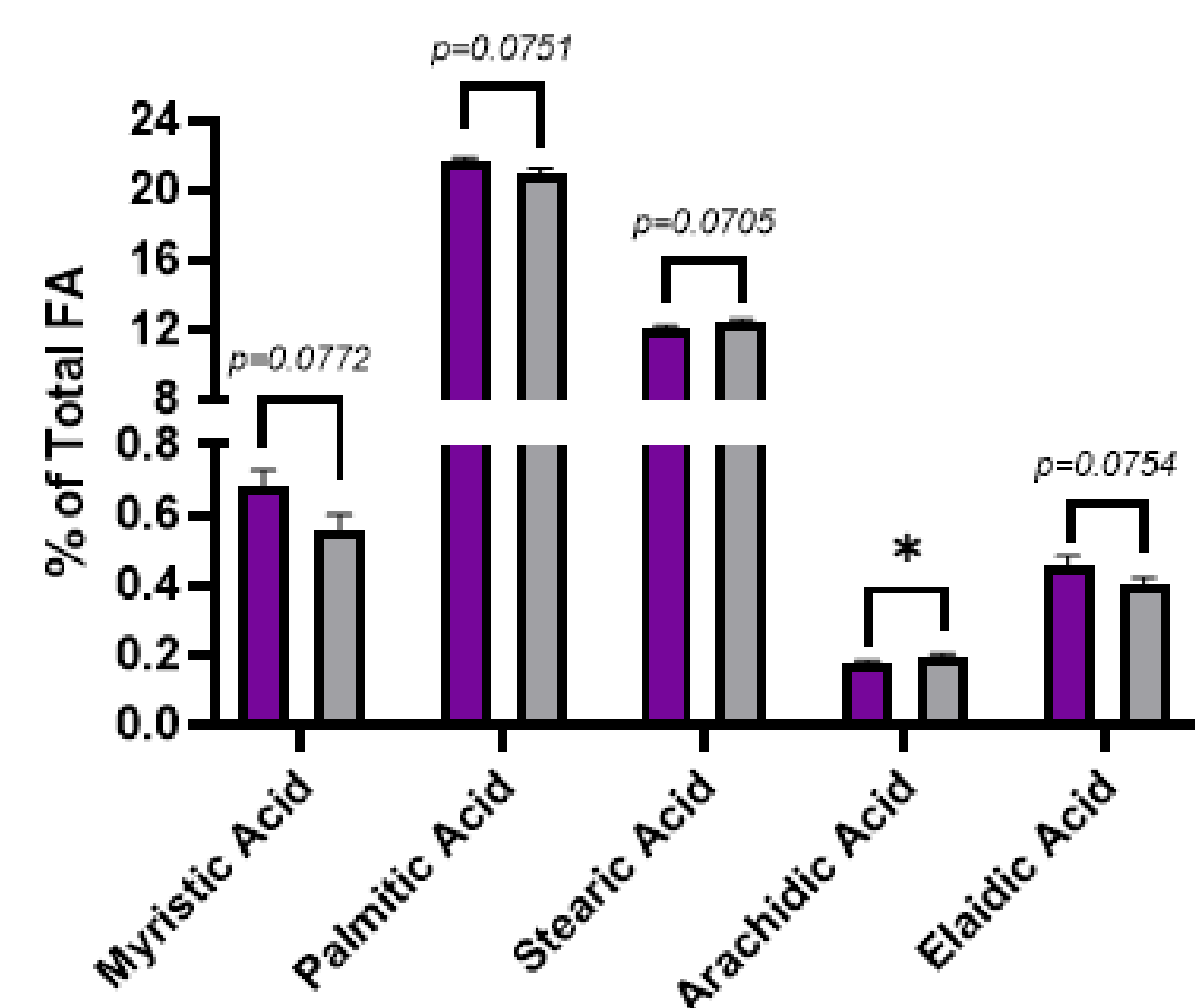


Fig. 3: Unpaired t-tests showed a trend towards higher levels of the saturated fatty acids; myristic, palmitic and stearic acid, a statistically significant increase in arachidic acid ($p=0.440$), and a trend towards higher levels of the trans-fatty acid, elaidic acid in supplement users compared to non-users.

CONCLUSION: Our findings indicate that commercial n-3 PUFA supplements increase n-3 PUFA and markedly decrease n-6 PUFA in whole blood samples using DBS technology. The elevated levels of pro-inflammatory saturated and trans-fatty acids found in supplement users emphasizes the need for further study of potential n-3 PUFA supplement contamination.

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ADDITIONAL ABBREVIATIONS: SEM = Standard Error of the Mean, EPA = eicosapentaenoic acid, DPA = docosapentaenoic acid, DHA = docosahexaenoic acid, AA = arachidonic acid, DTA = docosatetraenoic acid

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