Association between physical activity and immunogenicity of an inactivated virus vaccine against SARS-CoV-2 in patients with autoimmune rheumatic diseases.

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Supplementary material

Supplementary Methods. Physical activity questionnaire

English Version

Inquiries on physical activity and sedentary behavior

Important:

I – Patients must respond to the questions while taking into account their activities in a typical day or week before receiving their first shot of the COVID-19 vaccine.

II - Moderate-to-vigorous activities are stated herein as physical tasks that might require effort above rest or light activity level. This can result in somewhat heavy breathing and increased heart rate. It may also be accompanied by an increase in sweating. An individual may also notice while engaged in moderate-to-vigorous activities a score above 5 in a 1-10 (light to heavy) virtual scale of self-perceived exertion.

Question 1. Were you participating in any type of moderate-to-vigorous physical activity or sport in your free time? For example, walking fast, biking, dancing, swimming, working out at the gym, etc.?

a. No ( )
b. Yes ( )
c. Days per week involved in related activities: _____.
d. Minutes per day involved in related activities _____.

Question 2. Were you involved in moderate-to-vigorous physical domestic tasks when taking care of your own home? For example, cleaning, washing, vacuuming, landscaping, general maintenance, heavy lifting, going up and down stairs, etc.?

a. No ( )
b. Yes ( )
c. Days per week involved in related activities: _____.
d. Minutes per day involved in related activities: _____.

Question 3. Were you involved in moderate-to-vigorous physical tasks at work? For example, cleaning, washing, vacuuming, landscaping, general maintenance, heavy lifting, going up and down stairs, etc.?

a. No ( )
b. Yes ( )
c. Days per week involved in related activities: _____.
d. Minutes per day involved in related activities: _____.

Question 4. Were you involved in moderate-to-vigorous outdoors physical activities to go from one place to another? For example, walking, running or cycling from home to work or from college to the grocery store or to visit a friend etc.?

a. No ( )
b. Yes ( )

c. Days per week involved in related activities: _____.
d. Minutes per day involved in related activities:_____.

Question 5. How much time did you usually spend sitting and/or laying (while awake) on a typical weekday? For example, watching TV, reading, working, studying, riding transportation etc.?

a. Answer is given in total hours _____.

Question 6. How much time did you usually spend sitting and/or laying (while awake) on a typical weekend day? For example, watching TV, reading, working, studying, riding transportation etc.?

a. Answer is given in total hours _____.

Versão em Português

Questionário sobre atividade física e comportamento sedentário

Importante:

I - Por favor, responda às perguntas considerando sua rotina semanal ou diária habitual antes de receber sua primeira dose davacina contra o COVID-19.

II - Atividades moderadas e intensas podem ser entendidas como tarefas físicas realizadas em sua rotina que exijam esforços acima daquele quando em repouso ou em atividades leves. Isso pode ser percebido por uma respiração um pouco mais ofegante e um batimento cardíaco acelerado, podendo ser acompanhado ou não pelo suor. Você também pode classificar as atividades moderadas e intensas como aqueles com escores de esforços superiores a “5” em uma escala genérica de “1-10” (leve a pesado) de percepção de esforço.

Questão 1. Você praticava algum tipo de atividade física de moderada a intensa ou esporte no seu tempo livre, por exemplo, caminhar rápido, andar de bicicleta, dançar, nadar, malhar na academia e etc.?

a. Não ( )

b. Sim ( )

c. Dias por semana envolvidos em todas as atividades relacionadas: _____.

d. Minutos por dia envolvidos em todas as atividades relacionadas: _____.

Questão 2. Você estava envolvido em esforço físico de moderado a intenso relacionado a tarefas domésticas para cuidar da sua própria casa? Por exemplo, limpar, lavar, aspirar, jardinagem, consertos em geral, transporte de cargas, subir e descer escadas, etc.?

a. Não ( )

b. Sim ( )

c. Dias por semana envolvidos em todas as atividades relacionadas: _____.

d. Minutos por dia envolvidos em todas as atividades relacionadas: _____.

Questão 3. Você estava envolvido em esforço físico de moderado a intenso no trabalho? Por exemplo, limpar, lavar, aspirar, jardinagem, consertos em geral, transporte de cargas, subir e descer escadas, etc.?

a. Não ( )

b. Sim ( )

c. Dias por semana envolvidos em todas as atividades relacionadas: _____.

d. Minutos por dia envolvidos em todas as atividades relacionadas: _____.

Questão 4. Você estava envolvido em esforço físico de moderado a intenso durante deslocamento fora de casa, ou seja, para ir de um lugar ao outro? Por exemplo, caminhar, correr ou usar a bicicleta para trajetos de casa para o trabalho, da faculdade para o mercado, visitar um amigo etc.?

a. Não ( )

b. Sim ( )

c. Dias por semana envolvidos em todas as atividades relacionadas: _____.

d. Minutos por dia envolvidos em todas as atividades relacionadas: _____.

Questão 5. Quanto tempo você costumava passar sentado e / ou deitado (embora acordado) em um dia normal da semana? Por exemplo, assistindo TV, lendo, trabalhando, estudando, no transporte e etc.?

a. A resposta é dada em total de horas _____.

Questão 6. Quanto tempo você costumava passar sentado e / ou deitado (embora acordado) em um dia normal de fim de semana? Por exemplo, assistindo TV, lendo, trabalhando, estudando, no transporte e etc.?

a. A resposta é dada em total de horas _____.

Supplementary Table 1. Baseline characteristics of non-ARD individuals.

	Non-ARD (*n* = 197)
Age, *years*	47.0 [35.0–58.5]
Sex, f*emale*	131 (66.5)
Weight, *kg*	70.0 [60.0–83.0]
Height, *cm*	163.0 [157.0–170.0]
BMI, *kg/m²*	26.6 [23.5–30.5]
Overweight/Obese	105 (55.0)
Caucasian race	93 (47.2)
Smoking	21 (10.7)
Comorbidities	
Systemic arterial hypertension	46 (23.4)
Diabetes mellitus	24 (12.2)
Dyslipidemia	13 (6.6)
Cardiomyopathy	2 (1.0)
Chronic renal disease	0 (0.0)
Chronic obstructive pulmonar disease	2 (1.0)
Asthma	9 (4.6)
Interstitial lung disease	0 (0.0)
Pulmonary hypertension	0 (0.0)
Hematologic disease	0 (0.0)
Hepatic disease	1 (0.5)
Cancer	0 (0.0)
Stroke	0 (0.0)
Tuberculosis	0 (0.0)
Total physical activity, *min per week*	350.0 [60.0–900.0]
Total sedentary time, *hours per day*	5.0 [3.6–7.1]

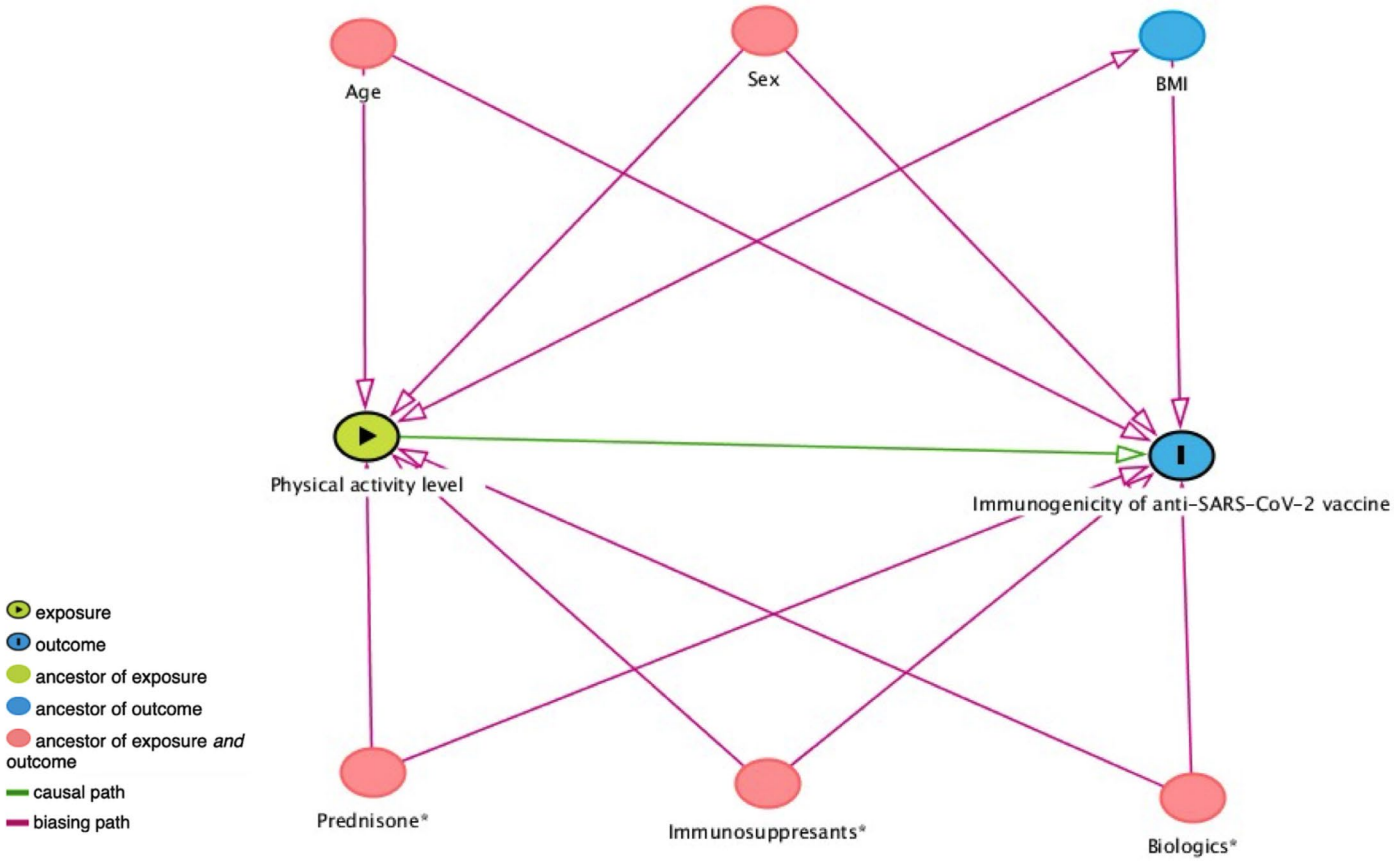
Data are presented as median [interquartile range] and *n* (%). ARD, autoimmune rheumatic disease; BMI, body mass index.
Note: Missing data for weight and BMI (*n* = 6).

Supplementary Table 2. Characteristics of autoimmune rheumatic diseases (ARD) patients and non-ARD individuals according to physical activity status.

	ARD Active (*n* = 494)	ARD Inactive (*n* = 404)	*P*-value	Non-ARD Active (*n* = 128)	Non-ARD Inactive (*n* = 69)	*P*-value
Age, *years*	47.0 [39.0-58.0]	56.0 [45.0-66.0]	**<.001**	48.0 [34.0-59.0]	47.0 [38.0-55.0]	.993
Age, < *60 years*	389 (78.7)	236 (58.4)	**<.001**	100 (78.1)	56 (81)	.617
Sex, *female*	378 (76.5)	305 (75.5)	.780	84 (65.6)	47 (68)	.845
BMI, kg/m^2	27.5 [24.2-31.6]	27.5 [24.2-31.6]	.343	26.4 [23.4-30.2]	26.8 [24.8-31.0]	.397
Prednisone	186 (37.7)	170 (42.1)	**<.001**	-	-	-
Biologic	164 (33.2)	163 (40.3)	**.032**	-	-	-
Immunosuppressants	313 (63.4)	269 (66.6)	.349	-	-	-

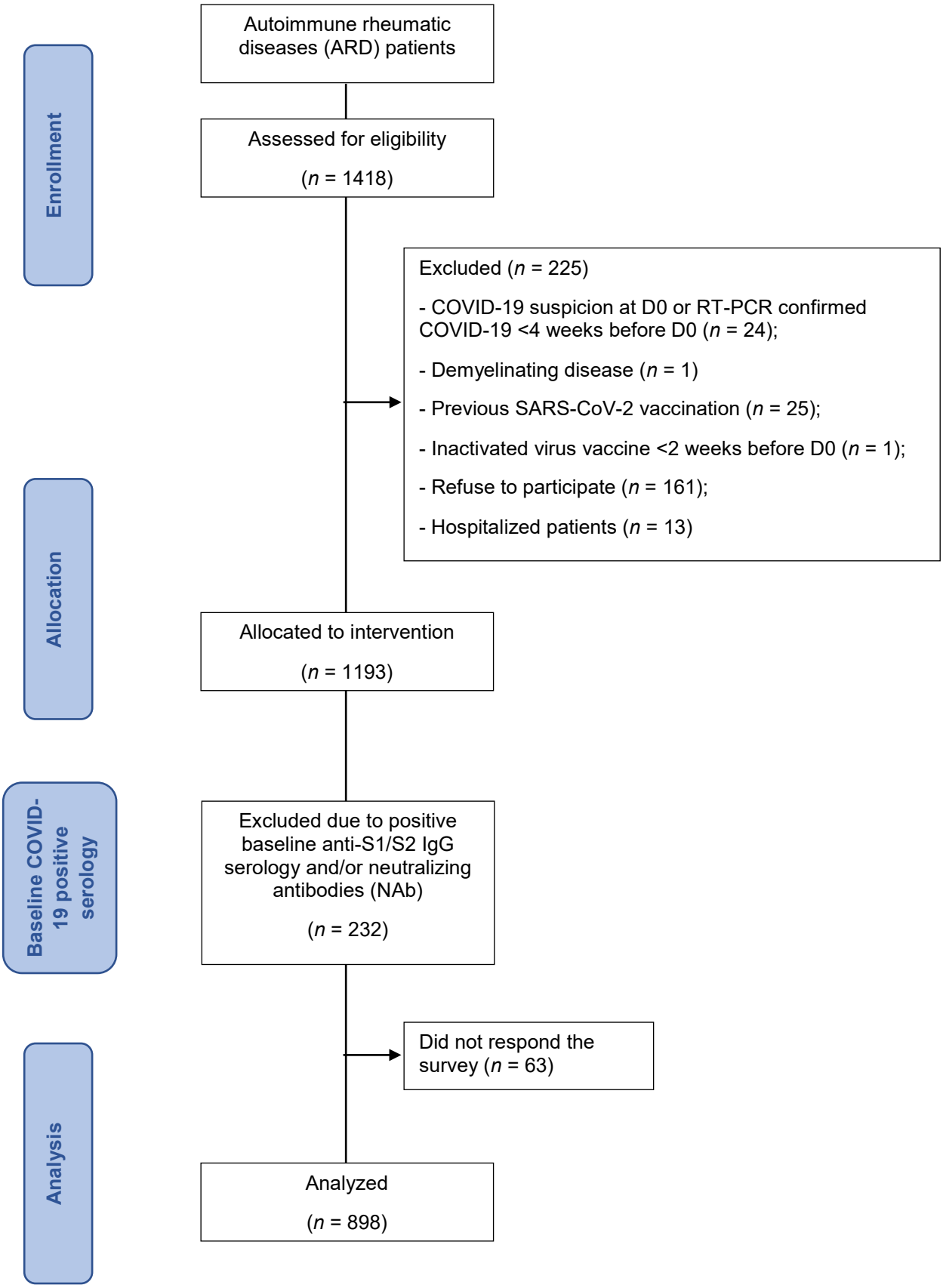
Results are expressed in median [interquartile range] and *n* (%). BMI, body mass index; ARD, autoimmune rheumatic diseases.

Note: Missing data for BMI (ARD, *n* = 1; non-ARD, *n* = 6).

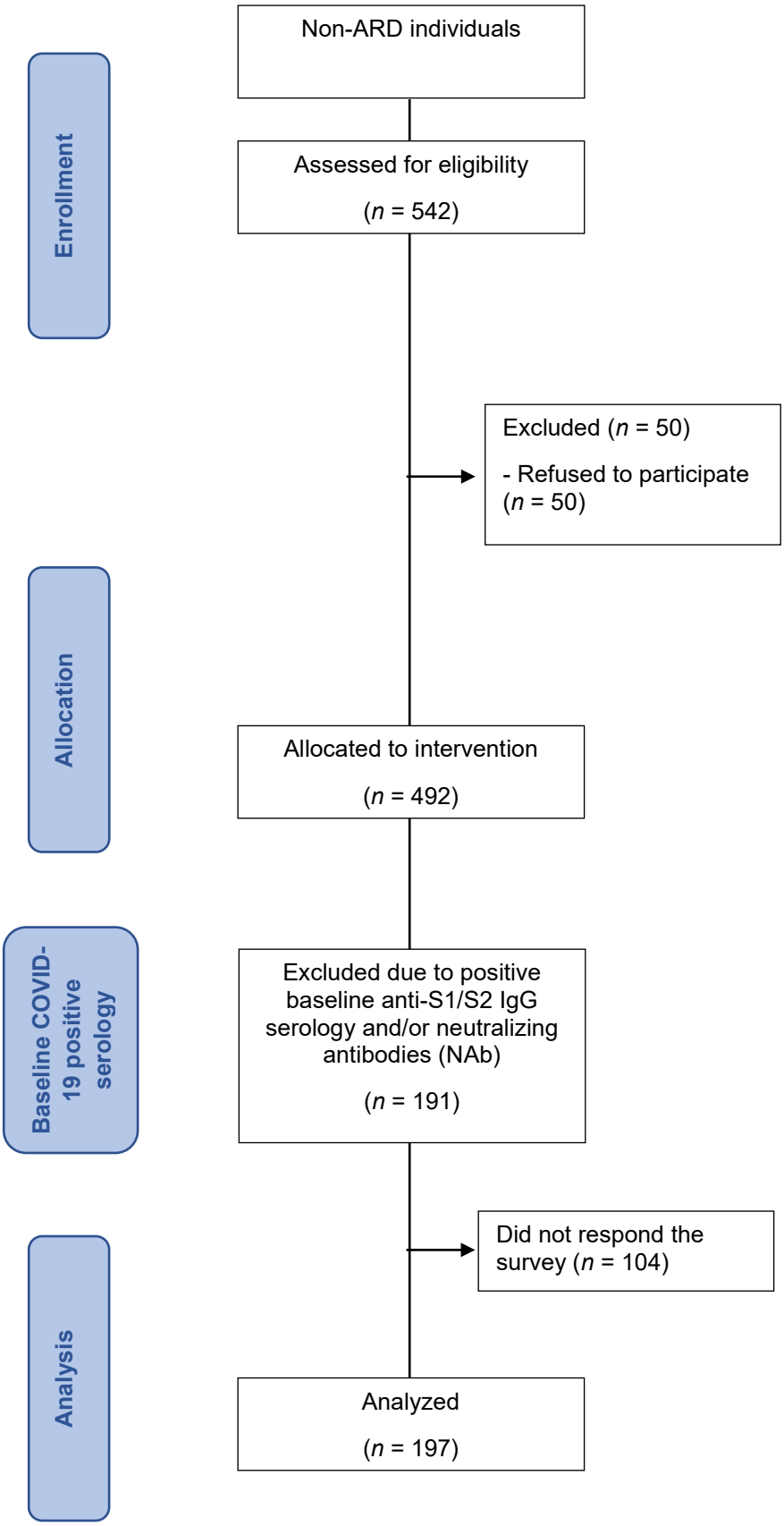


Supplementary Figure 1. Direct acyclic graph (DAG) of the association between physical activity level and immunogenicity of an anti-SARS-CoV-2 vaccine.

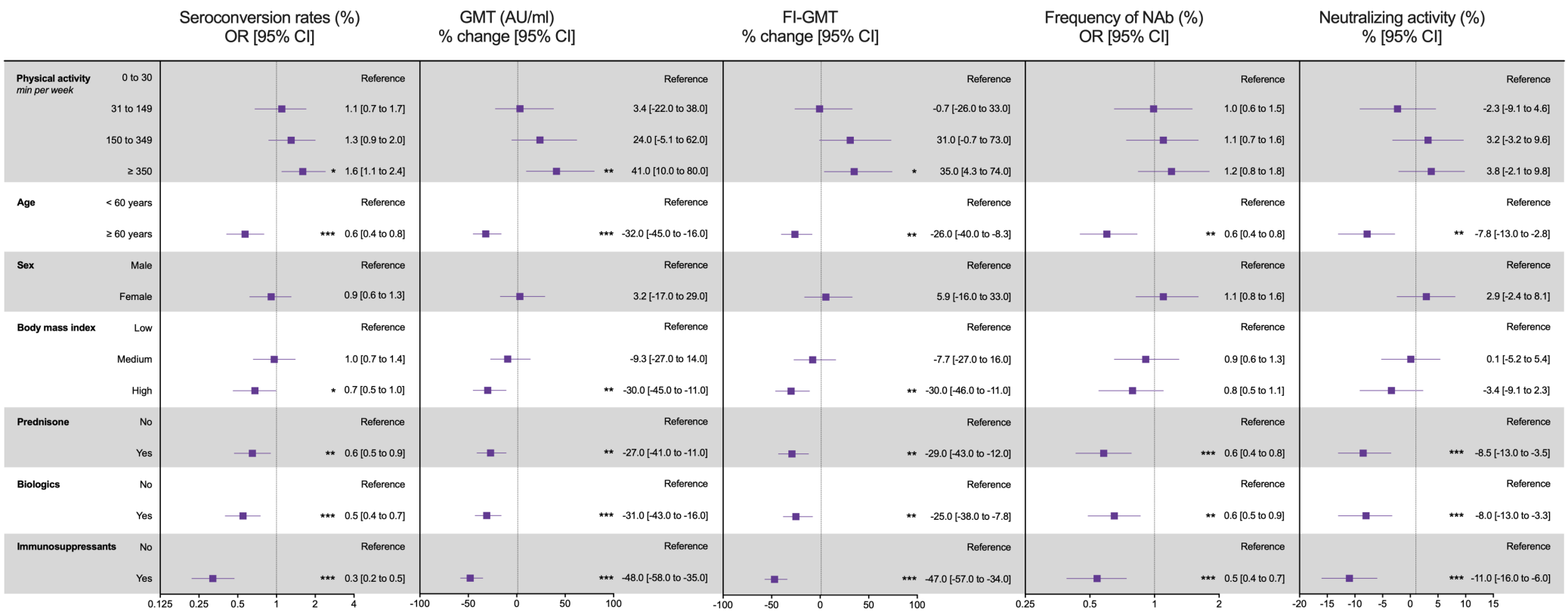
*Use of prednisone, immunosuppressants and biologics were only included in the models of ARD patients



Supplementary Figure 2. Flow diagram of ARD patients.



Supplementary Figure 3. Flow diagram of non-ARD individuals.



Supplementary Figure 4. Adjusted risk factors for immunogenicity data in autoimmune rheumatic diseases (ARD) patients according to physical activity volume.

Logistic regression to estimate odds ratios (ORs) and 95% confidence intervals (CIs) with binary data obtained for frequency of NAb and frequency of SC. Tobit regression was used for natural log transformed GMT, FI-GMT and neutralizing activity. Adjusted for age, sex, BMI, use of prednisone immunosuppressants and biologics. Data expressed as either percent or percent change [95% CI]) in patients with autoimmune rheumatic diseases following a vaccine against SARS-CoV-2. *P<.05, **P<.01, ***P<.001. Seroconversion was defined as a positive serology (IgG titer > 15 AU/ml) for anti-SARS-CoV-2 S1/S2 IgG antibodies after vaccination (Indirect ELISA, LIAISON® SARS-CoV-2 S1/S2 IgG, DiaSorin, Italy). Positivity for NAb was defined as a neutralizing activity ≥ 30% (cPass sVNT Kit, GenScript, Piscataway, USA).