

Online Supplement

Effects of cannabis on lung function: a population-based cohort study

Robert J Hancox, Richie Poulton, Margaret Ely, David Welch, D Robin Taylor, Christene R McLachlan, Justina M Greene, Terrie E Moffitt, Avshalom Caspi, Malcolm R Sears.

Online table 1. Frequency of cannabis and tobacco use at each age.

Cannabis use is reported for the past year, tobacco use is since the previous assessment.

Numbers in parentheses are the percentage of the sample assessed at each age.

Age	n	Cannabis use			Tobacco use		
		None	Less than Weekly	Weekly or more	None	Up to 10/day	More than 10/day
18	932	514 (55)	337 (36)	81 (9)	595 (64)	275 (30)	52 (7)
21	955	459 (48)	339 (36)	157 (16)	545 (57)	364 (38)	46 (5)
26	975	487 (50)	326 (33)	162 (17)	533 (55)	215 (22)	227 (23)
32	967	607 (63)	222 (23)	138 (14)	557 (58)	179 (19)	231 (24)

Online table 2. Lung function values according to cumulative joint-years of cannabis use by age 32.

Mean (SD) values for lung function.

(a) Non-smokers of tobacco - Women

	Cumulative joint years to age 32					
	Nil		Up to 1		More than 1	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
FEV₁ (L)	112	3.3 (0.5)	84	3.4 (0.4)	8	3.6 (0.6)
FVC (L)	112	4.1 (0.6)	84	4.3 (0.6)	8	4.3 (0.7)
FEV₁/FVC (%)	112	80.3 (6.1)	84	80.7 (5.6)	8	84.4 (6.8)
TLC (L)	107	5.5 (0.7)	81	5.6 (0.7)	7	6.0 (0.2)
FRC (L)	107	2.7 (0.6)	81	2.8 (0.6)	7	2.8 (0.6)
RV (L)	107	1.3 (0.3)	81	1.3 (0.3)	7	1.5 (0.3)
Raw (cmH₂O/L/s)	107	1.4 (0.6)	81	1.4 (0.7)	7	1.9 (1.2)
sGaw (mL/s/cmH₂O/L)	107	0.27 (0.13)	81	0.26 (0.12)	7	0.20 (0.10)
TLCO (mL/min/mmHg)	110	25.0 (3.6)	81	25.1 (3.4)	7	26.8 (4.3)
TLCO/VA (mL/min/mmHg/L)	110	4.9 (0.6)	81	4.9 (0.7)	7	4.9 (1.0)
VA (L)	110	5.1 (0.7)	81	5.2 (0.7)	7	5.5 (0.4)

(b) Non-smokers of tobacco - Men

	Cumulative joint years to age 32					
	Nil		Up to 1		More than 1	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
FEV₁ (L)	97	4.4 (0.6)	116	4.5 (0.6)	32	4.4 (0.6)
FVC (L)	97	5.7 (0.8)	116	5.8 (0.7)	32	5.8 (0.7)
FEV₁/FVC (%)	97	76.8 (6.8)	116	78.3 (6.5)	32	76.0 (7.0)
TLC (L)	93	7.4 (1.0)	114	7.4 (0.8)	31	7.5 (0.9)
FRC (L)	94	3.4 (0.8)	114	3.4 (0.7)	31	3.5 (0.7)
RV (L)	93	1.6 (0.5)	114	1.6 (0.3)	31	1.6 (0.5)
Raw (cmH₂O/L/s)	94	1.2 (0.8)	114	1.3 (0.9)	31	1.5 (1.0)
sGaw (mL/s/cmH₂O/L)	94	0.28 (0.14)	114	0.27 (0.17)	31	0.23 (0.15)
TLCO (mL/min/mmHg)	94	36.0 (5.0)	114	36.1 (6.0)	32	34.9 (5.1)
TLCO/VA (mL/min/mmHg/L)	94	5.2 (0.7)	114	5.1 (0.8)	32	4.9 (0.5)
VA (L)	94	7.0 (1.0)	114	7.1 (0.9)	32	7.2 (0.9)

(c) Moderate smokers of tobacco (up to 10 pack years) - Women

	Cumulative joint years to age 32					
	Nil		Up to 1		More than 1	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
FEV₁ (L)	14	3.3 (0.4)	57	3.4 (0.5)	5	3.3 (0.3)
FVC (L)	14	4.1 (0.6)	57	4.3 (0.5)	5	4.2 (0.4)
FEV₁/FVC (%)	14	81.4 (6.1)	57	79.8 (6.1)	5	77.1 (2.0)
TLC (L)	14	5.6 (1.0)	56	5.6 (0.6)	5	5.5 (0.8)
FRC (L)	14	2.8 (0.7)	56	2.9 (0.6)	5	2.8 (0.9)
RV (L)	14	1.4 (0.6)	56	1.3 (0.3)	5	1.3 (0.4)
Raw (cmH₂O/L/s)	14	1.2 (0.3)	56	1.4 (1.1)	5	1.4 (0.5)
sGaw (mL/s/cmH₂O/L)	14	0.31 (0.22)	56	0.28 (0.20)	5	0.24 (0.09)
TLCO (mL/min/mmHg)	14	24.1 (3.5)	55	24.5 (3.5)	5	23.1 (3.3)
TLCO/VA (mL/min/mmHg/L)	14	4.7 (0.6)	55	4.6 (0.6)	5	4.6 (0.4)
VA (L)	14	5.2 (0.9)	55	5.4 (0.6)	5	5.1 (0.7)

(d) Moderate smokers of tobacco (up to 10 pack years) - Men

	Cumulative joint years to age 32					
	Nil		Up to 1		More than 1	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
FEV₁ (L)	6	4.3 (0.7)	31	4.4 (0.7)	26	4.4 (0.8)
FVC (L)	6	5.5 (0.8)	31	5.7 (0.9)	26	5.9 (0.9)
FEV₁/FVC (%)	6	78.3 (3.9)	31	77.1 (5.4)	26	74.8 (6.8)
TLC (L)	6	7.0 (1.0)	31	7.3 (1.0)	25	7.7 (1.1)
FRC (L)	6	2.8 (0.7)	31	3.4 (0.7)	25	3.4 (0.8)
RV (L)	6	1.4 (0.4)	31	1.6 (0.3)	25	1.7 (0.4)
Raw (cmH₂O/L/s)	6	1.7 (0.6)	31	1.3 (0.7)	25	1.4 (0.7)
sGaw (mL/s/cmH₂O/L)	6	0.19 (0.07)	31	0.25 (0.17)	25	0.21 (0.11)
TLCO (mL/min/mmHg)	6	33.4 (7.0)	31	35.1 (4.1)	25	34.7 (4.7)
TLCO/VA (mL/min/mmHg/L)	6	5.1 (1.0)	31	5.1 (0.7)	25	4.7 (0.6)
VA (L)	6	6.6 (0.8)	31	7.0 (1.0)	25	7.5 (1.1)

(e) Heavy smokers of tobacco (more than 10 pack years) - Women

	Cumulative joint years to age 32					
	Nil		Up to 1		More than 1	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
FEV₁ (L)	26	3.2 (0.3)	85	3.3 (0.5)	43	3.3 (0.5)
FVC (L)	26	4.1 (0.4)	85	4.2 (0.6)	43	4.2 (0.6)
FEV₁/FVC (%)	26	78.1 (4.8)	85	79.0 (6.6)	43	78.6 (7.0)
TLC (L)	25	5.5 (0.5)	82	5.6 (0.8)	41	5.7 (0.8)
FRC (L)	25	2.7 (0.4)	82	2.8 (0.7)	41	3.0 (0.7)
RV (L)	25	1.3 (0.3)	82	1.4 (0.3)	41	1.5 (0.4)
Raw (cmH₂O/L/s)	25	1.4 (0.6)	82	1.4 (0.6)	41	1.6 (0.7)
sGaw (mL/s/cmH₂O/L)	25	0.26 (0.11)	82	0.25 (0.10)	41	0.21 (0.10)
TLCO (mL/min/mmHg)	24	22.7 (3.9)	83	23.7 (3.8)	42	20.7 (2.5)
TLCO/VA (mL/min/mmHg/L)	24	4.5 (0.7)	83	4.5 (0.6)	42	4.0 (0.7)
VA (L)	24	5.1 (0.5)	83	5.3 (0.8)	42	5.3 (0.7)

(f) Heavy smokers of tobacco (more than 10 pack years) - Men

	Cumulative joint years to age 32					
	Nil		Up to 1		More than 1	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
FEV₁ (L)	8	4.2 (0.9)	68	4.5 (0.5)	101	4.4 (0.7)
FVC (L)	8	5.4 (0.5)	68	5.9 (0.7)	101	5.8 (0.9)
FEV₁/FVC (%)	8	77.4 (12.0)	68	76.9 (5.7)	101	75.3 (7.6)
TLC (L)	8	7.2 (0.8)	65	7.7 (0.8)	92	7.7 (1.1)
FRC (L)	8	3.6 (0.7)	65	3.6 (0.7)	92	3.6 (0.9)
RV (L)	8	1.8 (0.3)	65	1.7 (0.4)	92	1.8 (0.5)
Raw (cmH₂O/L/s)	8	1.4 (0.9)	65	1.2 (0.6)	92	1.4 (0.7)
sGaw (mL/s/cmH₂O/L)	8	0.24 (0.15)	65	0.24 (0.12)	92	0.21 (0.11)
TLCO (mL/min/mmHg)	9	33.2 (6.4)	67	32.5 (5.1)	95	31.2 (5.7)
TLCO/VA (mL/min/mmHg/L)	9	4.9 (0.6)	67	4.5 (0.7)	95	4.4 (0.7)
VA (L)	9	6.8 (0.9)	67	7.3 (0.8)	95	7.2 (1.0)

Online table 3. Associations between cannabis use and lung function at age 32

Linear regression analyses of lung function at age 32 using cannabis exposure as the predictor. Analyses adjust for sex and, except for FEV₁/FVC and sGaw, for height. Analyses of TLCO also adjust for exhaled carbon monoxide and blood haemoglobin. Coefficients represent the difference in lung function associated with each joint-year of cannabis up to age 32.

	n	Coefficient	95% CI	p
FEV₁ (mL)	920	1.0	-6.1 to 8.0	0.788
FVC (mL)	920	12.0	3.8 to 20.1	0.004
FEV₁/FVC (%)	920	-0.14	-0.24 to -0.05	0.003
TLC (mL)	884	29.5	19.5 to 39.5	<0.001
FRC (mL)	885	22.0	12.7 to 31.3	<0.001
RV (mL)	884	16.6	11.5 to 21.7	<0.001
Raw (cmH₂O/L/s)	885	0.013	0.002 to 0.024	0.016
sGaw (mL/s/cmH₂O/L)	885	-4.2	-6.3 to -2.2	<0.001
TLCO (mL/min/mmHg)	842	-0.056	-0.122 to 0.009	0.093
TLCO/VA (mL/min/mmHg/L)	842	-0.023	-0.033 to -0.012	<0.001
VA (mL)	895	19.0	9.0 to 29.0	<0.001

Online table 4. Associations between tobacco use and lung function at age 32

Linear regression analyses of lung function at age 32 using tobacco exposure as the predictor.

Analyses adjust for sex and, except for FEV₁/FVC and sGaw, for height. Analyses of TLCO

also adjust for exhaled carbon monoxide and blood haemoglobin. Coefficients represent the

difference in lung function associated with each pack-year of tobacco up to age 32.

	n	Coefficient	95% CI	p
FEV₁ (mL)	920	-3.9	-8.7 to 0.9	0.113
FVC (mL)	920	3.6	-2.0 to 9.1	0.210
FEV₁/FVC (%)	920	-0.13	-0.19 to -0.07	<0.001
TLC (mL)	883	14.6	7.7 to 21.5	<0.001
FRC (mL)	884	14.9	8.5 to 21.3	<0.001
RV (mL)	883	9.9	6.4 to 13.5	<0.001
Raw (cmH₂O/L/s)	884	0.003	-0.004 to 0.011	0.413
sGaw (mL/s/cmH₂O/L)	884	-2.5	-3.9 to -1.1	0.001
TLCO (mL/min/mmHg)	841	-0.134	-0.189 to -0.079	<0.001
TLCO/VA (mL/min/mmHg/L)	841	-0.027	-0.035 to -0.018	<0.001
VA (mL)	894	7.4	0.6 to 14.3	0.034

Online table 5. Associations of cannabis and tobacco use with post-bronchodilator spirometry.

Linear regression analyses of post-bronchodilator spirometry at age 32 using both cannabis and tobacco exposures as predictors. Analyses adjust for sex and, except for FEV₁/FVC, for height. Coefficients represent the difference in lung function associated with each joint-year of cannabis or pack-year of tobacco up to age 32, adjusted for the use of the other substance.

		Cannabis			Tobacco		
	n	Coeff	95% CI	p	Coeff	95% CI	p
FEV₁ (mL)	892	7.2	-0.2 to 14.6	0.058	-6.7	-11.7 to -1.7	0.009
FVC (mL)	892	13.4	4.5 to 22.4	0.003	-0.8	-6.9 to 5.2	0.784
FEV₁/FVC (%)	892	-0.05	-0.14 to 0.04	0.310	-0.12	-0.18 to -0.06	<0.001

Online table 6. Longitudinal associations of cannabis use with spirometric lung function amongst non-tobacco smokers.

Linear regression analyses of lung function at age 32 using cannabis exposure as the predictor, adjusted for lung function at age 15. Analyses are restricted to those without a tobacco smoking history. Analyses adjust for sex, height, change in height between age 15 and 32, and current asthma at age 32. Coefficients represent the difference in lung function at age 32 associated with each joint-year of cannabis up to age 32.

	n	Coefficient	95% CI	p
FEV₁ (mL)	391	5.4	-7.1 to 18.0	0.396
FVC (mL)	391	13.4	-0.8 to 27.6	0.064
FEV₁/FVC (%)	391	-0.07	-0.23 to 0.08	0.348