

The effects of acute respiratory illness on exercise and sports performance outcomes in athletes – a systematic review by a subgroup of the IOC consensus group on “Acute respiratory illness in the athlete”

Supplementary Table S4: Detailed results of the longer term effects of acute respiratory infection on exercise and sports performance outcomes

Study	Illness classification	Diagnostic method	Study design / flow / testing	Timing of measurements in relation to ARinf	Exercise / sports performance parameter [outcome variables]	Results
Csulak et al. 2021 (Csulak, Petrov et al. 2021)	Confirmed general (upper/lower)	Physician diagnosis including pathology confirmed (PCR or culture) for pathogen	<ul style="list-style-type: none"> Hungarian Swimmers preparing for the Olympics were assessed on their return to training post-SARS-CoV-2 infection Training duration and change in standardised time-ranking points were compared to pre-infection and healthy control group performances from 2019-2021 	<ul style="list-style-type: none"> Point values from the FINA Point Scoring 2019 and 2021 tables 	<ul style="list-style-type: none"> <u>Training modification</u> <ul style="list-style-type: none"> Training hours/week <u>Change in standardised points</u> <ul style="list-style-type: none"> Performance analyses by time-ranking points (FINA) 	<p><u>Training modification:</u></p> <ul style="list-style-type: none"> Pre-COVID training hours/week = ARinf 24.5 ± 3.9; CON 24 ± 4.5 (p=0.71) Post-COVID training hours/week = ARinf 24.5 ± 3.9; CON 24 ± 4.5 (p=0.71) <p><u>Change in standardised points:</u></p> <ul style="list-style-type: none"> Improvement in points from 2019-2021 = ARinf 55.6% ; CON 54.5% (p=0.75)
Savicevic et al. 2021 (Savicevic, Nincevic et al. 2021)	Confirmed general (upper/lower)	Physician diagnosis including pathology confirmed (PCR or culture) for pathogen	<ul style="list-style-type: none"> Professional football players match running performance was assessed post-SARS-CoV-2 infection throughout the 2020/2021 season in Croatia Data were compared to pre-infection match averages and to non-infected teammates' averages in the same periods 	<p><u>ARinf</u></p> <ul style="list-style-type: none"> Pre-infection: all matches 30 days prior to infection Post infection: all matches after RTP (±4 months of the season) <p><u>CON</u></p> <ul style="list-style-type: none"> First half of season's matches 	<ul style="list-style-type: none"> <u>Match running performance (GPS)</u> <ul style="list-style-type: none"> [total distance covered (m), low-intensity running (<14.3km/h) (m), running (14.4-19.7km/h) (m), high-intensity running (>19.8km/h) (m), high speed running (19.8-25.1km/h) (m), sprinting (>25.2km/h) (m), total accelerations (>±0.5m/s²) (count), total decelerations (>±0.5m/s²) (count), high intensity accelerations (>±3m/s²) (count), high intensity decelerations (>±3m/s²) (count)] 	<p><u>MATCH PERFORMANCE:</u></p> <p><u>Total distance covered (m):</u></p> <ul style="list-style-type: none"> ARinf pre vs post SARS-CoV-2 = pre 10651.16 ± 918.15; post 10799.96 ± 765.13 (p=0.32) Post-SARS-CoV-2 = ARinf 10799.96 ± 765.13; CON 10776.08 ± 566.27 (p=0.93) <p><u>Low-intensity running (<14.3km/h) (m):</u></p> <ul style="list-style-type: none"> ARinf pre vs post SARS-CoV-2 = pre 8457.23 ± 524.94; post 8490.32 ± 519.02 (p=0.72) Post-SARS-CoV-2 = ARinf 8490.32 ± 519.02; CON 8518.35 ± 421.05 (p=0.88) <p><u>Running (14.4-19.7km/h) (m):</u></p> <ul style="list-style-type: none"> ARinf pre vs post SARS-CoV-2 = pre 1545.55 ± 469.29; post 1648.05 ± 397.37 (p=0.72) Post-SARS-CoV-2 = ARinf 1648.05 ± 397.37; CON 1562.42 ± 280.76 (p=0.54) <p><u>High-intensity running (>19.8km/h) (m):</u></p> <ul style="list-style-type: none"> ARinf pre vs post SARS-CoV-2 = pre 648.10 ± 193.85; post 662.52 ± 232.93 (p=0.76) Post-SARS-CoV-2 = ARinf 662.52 ± 232.93; CON 697.33 ± 197.31 (p=0.69) <p><u>High speed running (19.8-25.1km/h) (m):</u></p> <ul style="list-style-type: none"> ARinf pre vs post SARS-CoV-2 = pre 524.16 ± 135.83; post 538.72 ± 161.38 (p=0.68) Post-SARS-CoV-2 = ARinf 538.72 ± 161.38; CON 572.44 ± 160.10 (p=0.61) <p><u>Sprinting (>25.2km/h) (m):</u></p> <ul style="list-style-type: none"> ARinf pre vs post SARS-CoV-2 = pre 124.22 ± 72.55; post 123.64 ± 87.79 (p=0.97) Post-SARS-CoV-2 = ARinf 123.64 ± 87.79; CON 122.07 ± 56.76 (p=0.96) <p><u>Total accelerations (>±0.5m/s²) (count):</u></p> <ul style="list-style-type: none"> ARinf pre vs post SARS-CoV-2 = pre 479.08 ± 51.91; post 489.63 ± 47.98 (p=0.26) Post-SARS-CoV-2 = ARinf 72.4 ± 17; CON 62.0 ± 11 (p=0.024) <p><u>Total decelerations (>±0.5m/s²) (count):</u></p>

						<ul style="list-style-type: none"> • ARinf pre vs post SARS-CoV-2 = pre 480.52 ± 54.73; post 479.30 ± 57.60 (p=0.89) • Post-SARS-CoV-2 = ARinf 489.63 ± 47.98; CON 500.44 ± 42.63 (p=0.56) <p><u>High intensity accelerations (>±3m/s²) (count):</u></p> <ul style="list-style-type: none"> • ARinf pre vs post SARS-CoV-2 = pre 28.68 ± 11.56; post 21.22 ± 10.83 (p=0.04) • Post-SARS-CoV-2 = ARinf 21.22 ± 10.83; CON 18.87 ± 8.55 (p=0.28) <p><u>High intensity decelerations (>±3m/s²) (count):</u></p> <ul style="list-style-type: none"> • ARinf pre vs post SARS-CoV-2 = pre 38.10 ± 10.34; post 31.33 ± 15.28 (p=0.04) • Post-SARS-CoV-2 = ARinf 31.33 ± 15.28; CON 36.54 ± 9.35 (p=0.54)
Vaudreuil et al. 2021 ^(Vaudreuil, Kennedy et al. 2021)	Confirmed general (upper/lower)	Physician diagnosis including pathology confirmed (PCR or culture) for pathogen	<ul style="list-style-type: none"> • NBA basketball players match play performance was analysed post-SARS-CoV-2 infection and compared to pre-infection match and career averages 	<ul style="list-style-type: none"> • Matches played after SARS-CoV-2 positive test over the remainder of the season 	<ul style="list-style-type: none"> • <u>Match performance</u> <ul style="list-style-type: none"> ○ Minutes played, points, rebounds, assists, steals, blocks, turnovers, field goals [FG] made, FGs attempted, FG percentage, free throws [FT] made, FTs attempted, FT percentage, 3-point FGs made, 3-point [3P] FGs attempted, 3P FG percentage, offensive rebounds, defensive rebounds, and fouls 	<p><u>MATCH PERFORMANCE:</u></p> <ul style="list-style-type: none"> • Minutes played = pre 28.7; post 25.8; % change -10.0 (p=0.04) • Points = pre 14.5; post 12.9; % change -11.5 (p=0.06) • Rebounds = pre 5.7; post 5.1; % change -11.3 (p=0.13) • Assists = pre 3.7; post 3.5; % change -5.9 (p=0.23) • Steals = pre 0.9; post 0.8; % change -12.1 (p=0.30) • Blocks = pre 0.6; post 0.5; % change -6.7 (p=0.71) • Turnovers = pre 1.9; post 1.9; % change -1.6 (p=0.80) • FG made = pre 5.4; post 4.6; % change -15.6 (p=0.02) • FG attempted = pre 11.3; post 10.1; % change -10.5 (p=0.09) • FG % = pre 48.7; post 46.7; % change -4.1 (p=0.33) • FT made = pre 2.4; post = 2.5; % change 3.7 (p=0.56) • FT attempted = pre 3.1; post 3.3; % change 6.5 (p=0.33) • FT % = pre 79.0; post 78.2; % change -1.0 (p=0.82) • 3P made = pre 1.3; post = 1.2; % change -4.9 (p=0.70) • 3P attempted = pre 3.7; post 3.6; % change -3.6 (p=0.73) • 3P % = pre 30.3; post 37.8; % change 24.9 (p=0.19) • Offensive rebounds = pre 1.3; post 1.2; % change -9.8 (p=0.38) • Defensive rebounds = pre 4.5; post 3.9; % change -11.9 (p=0.11) • Fouls = pre 2.4; post 2.3; % change -1.6 (p=0.82)
Wagemans et al. 2021 ^(Wagemans, Catteuw et al. 2021)	Confirmed general (upper/lower)	Physician diagnosis including pathology confirmed (PCR or culture) for pathogen	<ul style="list-style-type: none"> • Weekly SARS-CoV-2 testing and assessment of hamstring, hip abductor, and hip adductor strength and jump performance (using Vald performance devices) in professional football players • Positive SARS-CoV-2 athletes compared to within-subject and non-infected controls pre- and post-infection 	<ul style="list-style-type: none"> • 2 weeks, 4 weeks, 6 weeks and 8 weeks after SARS-CoV-2 positive test 	<ul style="list-style-type: none"> • <u>Muscle strength</u> <ul style="list-style-type: none"> ○ CMJ (cm) ○ Bilateral hip abduction (N), hip adduction (N), Nordic hamstring (N) 	<p><u>MUSCLE STRENGTH:</u></p> <p><u>CMJ (cm)</u></p> <ul style="list-style-type: none"> • 2 weeks post (MD (95%CI)) = 4.32 (-4.73 to 13.36) • 4 weeks post (MD (95%CI)) = 3.11 (-4.86 to 11.09) • 6 weeks post (MD (95%CI)) = 2.54 (-3.22 to 8.30) • 8 weeks post (MD (95%CI)) = 2.45 (-4.63 to 9.54) <p><u>Hip ABD L (N)</u></p> <ul style="list-style-type: none"> • 2 weeks post (MD (95%CI)) = -9.13 (-44.03 to 25.76) • 4 weeks post (MD (95%CI)) = -17.39 (-50.18 to 15.40) • 6 weeks post (MD (95%CI)) = -3.76 (-37.51 to 29.98) • 8 weeks post (MD (95%CI)) = -0.74 (-37.79 to 36.31) <p><u>Hip ABD R (N)</u></p> <ul style="list-style-type: none"> • 2 weeks post (MD (95%CI)) = -12.24 (-44.67 to 20.19) • 4 weeks post (MD (95%CI)) = -16.89 (-47.25 to 13.47) • 6 weeks post (MD (95%CI)) = -3.50 (-34.76 to 27.76) • 8 weeks post (MD (95%CI)) = 2.05 (-32.29 to 36.39) <p><u>Hip ADD L (N)</u></p> <ul style="list-style-type: none"> • 2 weeks post (MD (95%CI)) = -14.14 (-74.40 to 46.13) • 4 weeks post (MD (95%CI)) = -31.81 (-88.14 to 24.53) • 6 weeks post (MD (95%CI)) = -18.46 (-76.50 to 39.58) • 8 weeks post (MD (95%CI)) = -10.14 (-73.87 to 53.59) <p><u>Hip ADD R (N)</u></p>

						<ul style="list-style-type: none"> • 2 weeks post (MD (95%CI)) = -21.31 (-82.08 to 39.46) • 4 weeks post (MD (95%CI)) = -33.40 (-90.12 to 23.32) • 6 weeks post (MD (95%CI)) = -15.89 (-74.36 to 42.58) • 8 weeks post (MD (95%CI)) = -6.92 (-71.11 to 57.26) <p><u>Nordic L (N)</u></p> <ul style="list-style-type: none"> • 2 weeks post (MD (95%CI)) = 26.28 (-19.61 to 72.16) • 4 weeks post (MD (95%CI)) = 38.32 (-6.10 to 82.65) • 6 weeks post (MD (95%CI)) = 13.58 (-32.02 to 59.18) • 8 weeks post (MD (95%CI)) = 7.07 (-44.70 to 58.84) <p><u>Nordic R (N)</u></p> <ul style="list-style-type: none"> • 2 weeks post (MD (95%CI)) = 41.48 (-3.79 to 86.75) • 4 weeks post (MD (95%CI)) = 34.76 (-8.91 to 78.42) • 6 weeks post (MD (95%CI)) = 23.40 (-21.51 to 68.29) • 8 weeks post (MD (95%CI)) = 16.47 (-34.54 to 67.48)
He et al. 2013 ^(He, Handzlik et al. 2013)	Suspected upper ARinf	Symptom checklist with algorithm/scoring system	<ul style="list-style-type: none"> • Prospective study in endurance athletes • Daily illness log data • Weekly training load monitored for 16 weeks 	<ul style="list-style-type: none"> • Effects of ARinf over 16 weeks 	<ul style="list-style-type: none"> • <u>Training modification:</u> <ul style="list-style-type: none"> ○ Rating of illness impact on ability to train (above normal, at the same level, below normal or training stopped) ○ Training load (IPAQ – MET-hr/week) 	<p><u>Training modification</u></p> <ul style="list-style-type: none"> • 70% of subjects with an ARinf reduced their weekly training load by an average of 24%
Fricker et al. 2005 ^(Fricker, Pyne et al. 2005)	Suspected upper ARinf	Physician diagnosis (by history and clinical examination)	<ul style="list-style-type: none"> • Prospective observational study in distance runners • Daily illness log data • Weekly training volume, load and intensity monitored over 4 months 	<ul style="list-style-type: none"> • Effects of ARinf over 4 months 	<ul style="list-style-type: none"> • <u>Training modifications:</u> <ul style="list-style-type: none"> ○ Training volume (km/wk) ○ Training load (mileage x intensity) ○ Training intensity (1-5; 1 = light, 5 = maximal) 	<p><u>Training modification</u></p> <ul style="list-style-type: none"> • Training volume higher in healthy (127 ± 21) vs. illness-affected (92 ± 39) runners (p=0.01) • Training load higher in healthy (269 ± 39) vs. illness-affected (220 ± 91) runners (p=0.05) • Training intensity was higher in the illness-affected runners (2.5 ± 0.5) than in the healthy runners (2.1 ± 0.2) (p=0.05)
Pyne et al. 2000 ^(Pyne, McDonald et al. 2000)	Suspected general ARinf	Physician diagnosis (by history and clinical examination)	<ul style="list-style-type: none"> • Prospective study in elite swimmers • ARinf illness episodes recorded over 5-month study period • Performance of each swimmer's best event rated in terms of the International Point Score (IPS) and final placing of each swimmer's best event 	<ul style="list-style-type: none"> • Effects of ARinf over 5-month study period 	<ul style="list-style-type: none"> • <u>Change in standardised points:</u> <ul style="list-style-type: none"> ○ Change in FINA IPS system between two major competitions 	<p><u>Change in standardised (FINA) points:</u></p> <ul style="list-style-type: none"> • Competitive performance was higher in healthy swimmers (mean FINA = 955 points) than ARinf swimmers (mean FINA = 937 points) (p=0.11) at the second competition

***ABD:** abduction; **ADD:** adduction; **ARinf:** infective acute respiratory illness; **CON:** control group; **GPS:** global positioning system; **IPAQ:** international physical activity questionnaire; **L:** left; **MET:** metabolic equivalent; **PCR:** polymerase chain reaction; **R:** right