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**Acute Cardiopulmonary Effects of Extreme Cold Through Whole Body Cryotherapy in Competitive Athletes**

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**Introduction:** We have recently reported high prevalence of pulmonary congestion (B-lines by ultrasound) with preserved myocardial strain during competitive swimming in extreme cold waters. Whether these findings are driven by exercise, cold exposure, or their combination remains unclear. Extreme cold exposure at rest is increasingly used as a novel muscular recovery strategy for high-performance athletes but its acute cardiovascular effects are not fully characterized. We aimed to evaluate the acute effects of isolated passive extreme cold exposure on cardiac function and pulmonary congestion in professional soccer players. **Methods:** We prospectively included 28 young professional soccer players from Inter Miami FC undergoing resting whole-body cryotherapy (WBC). Participants were evaluated immediately before and after resting in extreme cold in a WBC chamber (CryoStar Antarctica WBC Electric™, duration 2-3 minutes, temperature -166°F), without concomitant exercise. Transthoracic echocardiography and bilateral lung ultrasound for B-line detection were performed at both time points and subsequently analyzed at a Core Lab. Pre- and post- WBC Echocardiographic parameters were compared using paired analyses. **Results:** The mean (SD) age was 18.6 (4.6) years, and all participants were male. Cardiovascular and respiratory risk factors were absent (Table). Left ventricular (LV) systolic function remained stable after extreme cold exposure (ejection fraction, stroke volume, ventricular volumes). A small, statistically significant reduction in LV global longitudinal strain was observed (-23.7% to -22.6%,  $p = 0.046$ ), with values remaining within the normal range (Table). Right ventricular strain was unchanged. No pulmonary B-lines were detected either before or after exposure. Heart rate decreased after cryotherapy, whereas blood pressure and other vital signs remained stable. **Conclusion:** In young professional soccer players, short-term isolated exposure to extreme cold appears to be hemodynamically well tolerated in the acute setting, without clinically relevant changes in biventricular function, myocardial strain, or pulmonary congestion.

Table. Baseline characteristics and echocardiographic findings

Baseline clinical characteristics			
Variable	Baseline (N = 28)		
Age (mean (SD))	18.1 (4.6)		
Male sex, n (%)	28 (100%)		
Cardiovascular risk factors	0		
Prior cardiovascular disease, n (%)	1 (3.6%)*		
*History of surgically corrected aortic coarctation.			
Main clinical and echocardiographic findings			
Variable	Baseline	Post-cryotherapy	p-value
Blood pressure (mmHg)	121/70	121/61	NA
Heart rate (bpm)	73.43 (17.23)	68.50 (18.00)	0.016
Oxygen saturation (%)	98.18 (1.65)	98.71 (1.15)	0.154
LV ejection fraction (%)	39.5 (2.4)	60 (3.7)	0.410
LV stroke volume index (ml·m <sup>-2</sup> )	52.8 (6.6)	54.9 (8.3)	0.276
LV end-diastolic volume index (ml·m <sup>-2</sup> )	89.9 (10.7)	91.7 (12.1)	0.450
LV end-systolic volume index (ml·m <sup>-2</sup> )	36.8 (5.2)	36.7 (6.2)	0.917
LV GLS (%)	-23.7 (3.2)	-22.6 (3.1)	0.046
RV GLS (%)	-27.5 (5.4)	-27.4 (5.0)	0.843
RV free wall strain (%)	-29.4 (13.8)	-31.8 (5.7)	0.585
LA reservoir strain (%)	30 (8.3)	30.5 (7.5)	0.804
Lung ultrasound B-lines n (%)	0	0	

Abbreviations: LV = left ventricle; RV = right ventricle; GLS = global longitudinal strain, LA = left atrial.

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**The Rational Choice for Calculation of Average E/e' Ratio: A Pilot Study Comparing the Consistency and Diagnostic Performances of Two Calculation Methods**

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**Background:** The averaged E/e' ratio is a key echocardiographic parameter for evaluation of left ventricular diastolic function by predicting increased left ventricular filling pressures (LVFPs), yet its interpretation of calculation method for average E/e' ratio is ambiguous (E/e' = E / [(e' + e's)/2] vs. E/e'2 = (E/e'1 + E/e's)/2). This study aimed to compare the consistency and diagnostic performances of two calculation methods for the average E/e' ratio in patients with heart failure, as well as their performances in subgroups stratified by age and gender. **Methods:** A total of 1390 healthy subjects from the EMINCA database were

initially adopted to establish the normal range and diagnostic threshold for E/e'1 and E/e'2 respectively. Meanwhile, 384 subjects (213 heart failure patients with reduced ejection fraction, 171 healthy controls) were retrospectively analyzed. Echocardiographic parameters were measured, and both E/e' ratios were calculated by two methods. McNemar's test and Cohen's kappa coefficient were used to assess consistency of the two calculation methods. The diagnostic performance (sensitivity, specificity, positive predictive value [PPV], negative predictive value [NPV], accuracy, and area under the curve [AUC]) of the two methods was compared. Furthermore, the diagnostic performance was compared after stratification by age and gender. **Results:** Although the two methods showed high consistency (kappa=0.958, P=0.625), the overall AUC of E/e'2 was significantly higher (0.746 vs. 0.721, P < 0.001). Stratified analysis further revealed superior AUC performance of E/e'2 in younger (18-59 years) and male subgroups. **Conclusion:** E/e'2 demonstrates better comprehensive diagnostic efficacy, especially in young males, its application may improve clinical diagnostic accuracy.

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**Preserved Diastolic Mechanics in Masters Athletes Despite Age-Related Increases in Left Ventricular Filling Pressure**

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**Background:** Sedentary aging is associated with deleterious effects on cardiorespiratory fitness and left ventricular (LV) diastolic function. Conversely, masters athletes demonstrate blunted reductions in both. There is limited data interrogating the relationships between age, cardiorespiratory fitness, and the dynamic nature of LV filling in this cohort. **Methods:** Twenty-seven masters athletes (40-69 yrs of age), defined as >15 yrs of continuous athletic training for ≥ 7 hr/week and engagement in competitive events, were stratified into groups by decade of age (40s: n = 10; 50s: n = 9; 60s: n = 8). At rest, LV end-diastolic pressure (LVEDP) was estimated utilizing the ratio of early diastolic peak mitral inflow velocity to mitral annular tissue velocity by two-dimensional (2D) Doppler echocardiography. LVEDP-volume relationship (LVEDPV) was derived from the estimated LVEDP and the biplane LV end-diastolic volume (LVEDV). To account for the influence of the curve-fitting constant ( $\alpha$ ) and diastolic stiffness constant ( $\beta$ ), on the LVEDPV shape and position,  $\alpha$  and  $\beta$  were derived for each subject and used to predict the LVEDV at a LVEDP of 30 mmHg (LVEDV<sub>30</sub>). LVEDV<sub>30</sub> indexed to body surface area was used as a measure of LV diastolic stiffness. Left atrial reservoir strain (LASr) was quantified by 2D speckle-tracking echocardiography. Cardiorespiratory fitness was defined as peak oxygen uptake (VO<sub>2peak</sub>) through indirect-calorimetry during a standard treadmill cardiopulmonary exercise test. **Results:** Aging was associated with an increase in LVEDP (40s: 8.5 ± 0.7 mmHg; 50s: 9.5 ± 0.6 mmHg; 60s: 9.5 ± 1.0 mmHg, P = 0.018). However, this did not translate into an impairment in LV diastolic stiffness (P = 0.618). LASr did not differ by age (P = 0.194). VO<sub>2peak</sub> was preserved with age (P = 0.288). Based on VO<sub>2peak</sub> values, participants were stratified post hoc by cardiorespiratory fitness into low (30-45 mL/kg/min; 39 ± 4 mL/kg/min, n = 18) and high (> 45 mL/kg/min; 50 ± 5 mL/kg/min; n = 9) fitness groups. High cardiorespiratory fitness was associated with a less stiff LV during diastole (low: 104 ± 11 mL/m<sup>2</sup>; high: 120 ± 109 mL/m<sup>2</sup>, P = 0.021), and a higher LASr (low: 29 ± 6%; high: 40 ± 10%, P = 0.001). LASr and LVEDV<sub>30</sub> were significantly correlated (R = 0.515, P = 0.006). **Conclusions:** Despite the age-related increase in LVEDP, cardiorespiratory fitness was preserved in masters athletes and was associated, in part, with favorable LV diastolic stiffness and LA reservoir strain. These findings support the utility of LVEDV<sub>30</sub> and LASr as complementary markers characterizing LV filling dynamics with age in this unique population.

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**Rate and Predictors of Abstract Conversion to Peer-Reviewed Manuscript: Examining the Quality and Impact of Abstracts Presented at the 30th Annual American Society of Echocardiography Scientific Sessions**

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**Introduction:** Results from medical conference abstracts are often difficult to find, preliminary, and limited in detail compared to what is published in subsequent peer-reviewed manuscripts. We aimed to determine the rate and predictors of successful manuscript conversion for abstracts presented at the 30<sup>th</sup> Annual American Society of Echocardiography Scientific Sessions in 2019. **Methods:** We systematically cross-referenced published abstracts from 2019 with PubMed and Google Scholar using 1) full title, 2) all authors, and 3) first and/or last author. A matching publication must have assessed the same primary endpoints and included either the first or last author. Abstract and manuscript characteristics were analyzed. **Results:** Of 362 presented abstracts, 182 (50.1%) were converted to published manuscripts with a median time to publication of 18 months (IQR 11, 32). There were no significant differences in characteristics between published and unpublished abstracts (Table 1). Among published manuscripts, the median 5-year journal impact factor was 4.3 (IQR 1.9, 6.2) and median number of citations was 11 (IQR 5, 29). Abstracts focusing on adults were associated with fewer months to publication (median 16 [IQR 9.5, 25],  $p=0.007$ ) compared to pediatric (median 25 [IQR 13, 35]) and mixed-age (median 34 [IQR 14.5, 43.5]) abstracts (Table 2). Receipt of award at the Scientific Sessions was associated with publication in a journal with a higher 5-year impact factor (median impact factor 8.6 [IQR 6.2, 13.5] vs 3.7 [1.9, 6.2],  $p=0.006$ ). Receipt of award and oral presentation were associated with higher number of manuscript citations. **Conclusions:** A higher proportion of abstracts were published compared to medical conference outcomes reported in large systematic reviews, although opportunity for improvement remains. By emphasizing the importance of abstract conversion to full peer-reviewed publication, these data can inform strategies to enhance the quality and impact of research presented at future Scientific Sessions.