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Normal Reference Values For Chamber Size And Function In Male Endurance Athletes: A Meta-analysis Of Cardiac Magnetic Resonance Studies

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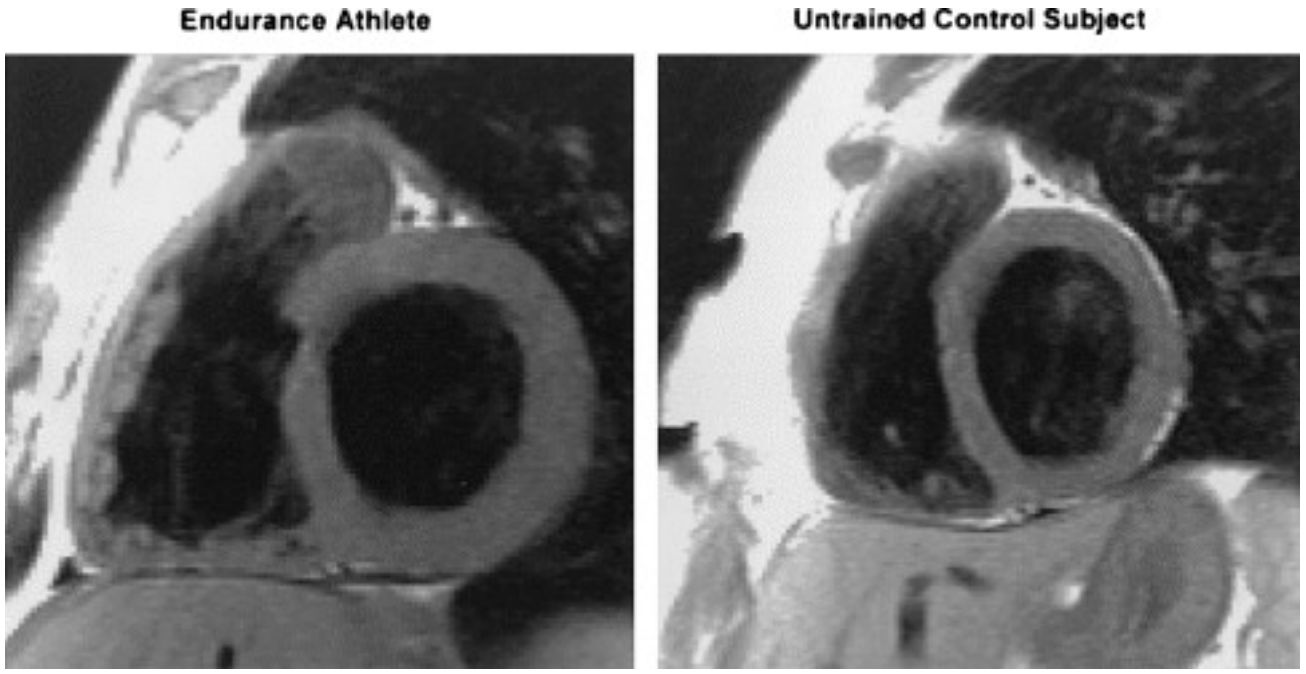
Heart Center

Conflicts of interests

Introduction

- Athletic training is well known to cause cardiac remodeling, such that traditional reference values for chamber size and function are not applicable.



Introduction

- The lack of athlete-specific reference values has led to clinical uncertainty in differentiating physiological remodeling from pathological cases.

- Several small series have evaluated normal chamber size and function in athletes, yet their data have not been broadly adopted due to limited sample size.

Objectives

- To perform a meta-analysis of published studies to define normal reference values for measurements of cardiac size and function by cardiac magnetic resonance.

Methods

- We systematically searched the Cochrane Library, EMBASE, and MEDLINE databases (from inception to November 2011) to identify all published CMR studies of athletes participating in endurance sports.
- Athletes in these studies were compared with healthy non-athletic subjects.
- We limited the current analysis to male athletes since data for females were scarce.

Methods

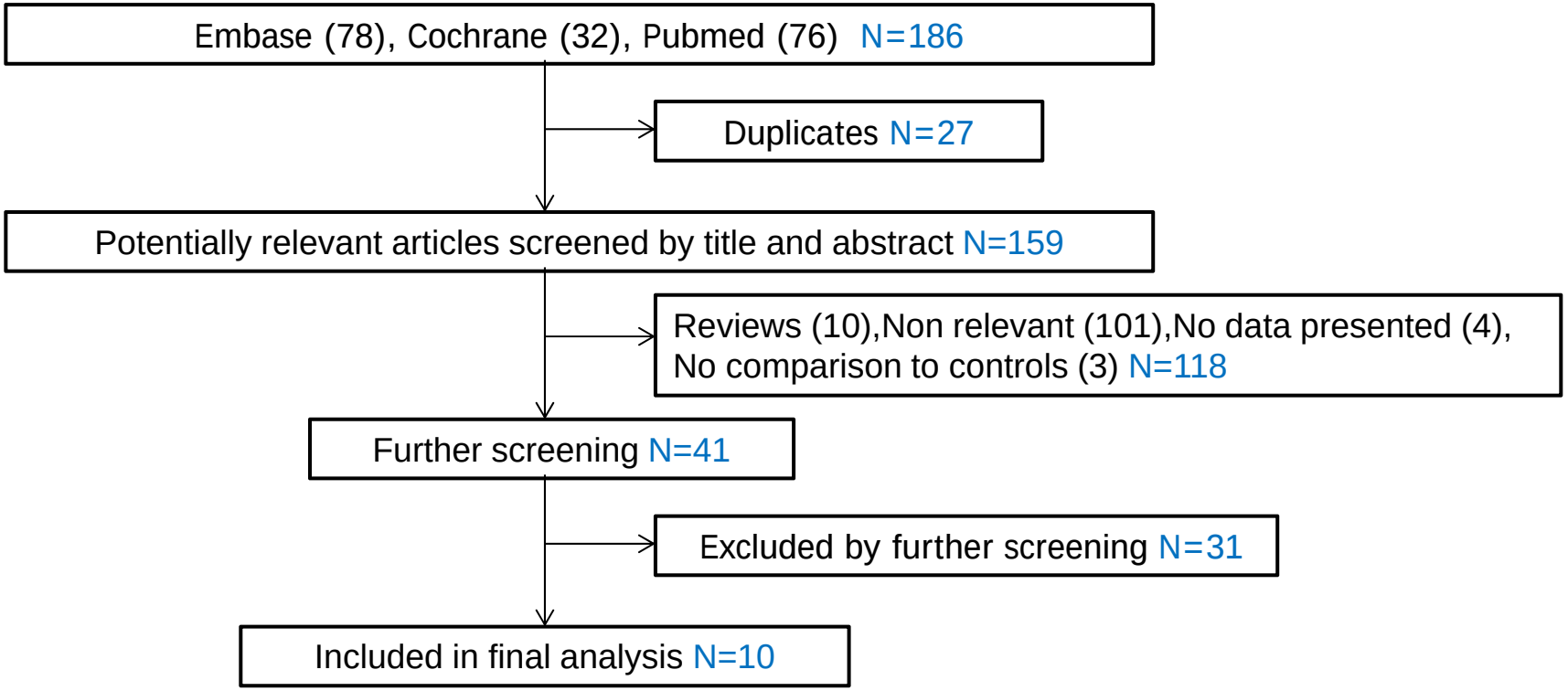
- All CMR protocols were based on SSFP sequences at 1.5T, and measurements were made using manual contour tracing and exclusion of papillary muscles.

- A random effect meta-analysis model was used to generate three point estimates: a mean value, upper reference limit (URL), and lower reference limit (LRL) for each parameter, as well as a 95% confidence interval surrounding each point estimate.

Results

- Ten studies encompassing 348 male athletes and 222 healthy male volunteers (mean age 22 to 50 years) met our inclusion criteria

Results- Flow chart



Search terms

"athletes"[MeSH Terms] OR "athletes"[All Fields] OR "athlete"[All Fields]
"heart"[MeSH Terms] OR "heart"[All Fields]
"magnetic resonance spectroscopy"[MeSH Terms] OR ("magnetic"[All Fields] AND "resonance"[All Fields] AND "spectroscopy"[All Fields]) OR "magnetic resonance spectroscopy"[All Fields] OR ("magnetic"[All Fields] AND "resonance"[All Fields]) OR "magnetic resonance"[All Fields]

Results – studies characteristics

Author	Year	Athletic group	Athletes men N=	Control men N=
Prakken	2011	Triathletes, runners, cyclists	55	32
Scharf	2010	triathletes	26	27
Scharf	2010	Soccer players	29	29
Prakken	2010	Regular, elite	129	56
Perseghin	2007	Runners	23	10
Petersen	2010	Rowers, swimmers, triathletes	23	21
Gyimes	2004	Triathletes, runners	14	6
Scharhag	2002	Triathletes, runners, cyclists	21	21
Pluim	1998	Cyclists	21	12
Turpeinen	1996	Triathletes, cross-country skiers	7	8
TOTAL N=			**348**	**222**

Results –meta-analysis

Parameter	Lower estimate		Mean estimate		Upper estimate	
	Athletes	controls	Athletes	controls	Athletes	controls
LV-EF%	49	50	60	60	70	70
RV-EF%	45	47	54	56	63	65

Results –meta-analysis

Parameter	Lower estimate		Mean estimate		Upper estimate	
	Athletes	controls	Athletes	controls	Athletes	controls
LV MASS (gr)	131	109	173	141	215	173
LV MASS indexed (gr/m2)	62	48	83	63	103	78
LV-EDV indexed (ml/m2)	83	67	108	88	133	110
RV-EDV indexed (ml/m2)	89	72	117	96	144	120

Conclusions

- The results of this meta-analysis provide normal reference values for cardiac chamber size and function measurements by CMR in male endurance athletes compared with healthy non-athletic subjects.

Thank you