

**SHHS MANUSCRIPT PROPOSAL**  
**ARIC MS#1034**

1. **FULL TITLE:**  
Association of Physical Activity with Sleep Disordered Breathing  
  
**ABBREVIATED TITLE:**  
Physical Activity and SDB
2. **PROPOSED WRITING GROUP MEMBERS:**  
Stuart F. Quan (chair), Duane Sherrill, Jason Quan + Nominees TBN
3. **TIMELINE [TARGET START AND FINISH DATES]**  
Analysis will begin after writing group chair completes MS#
4. **RATIONALE:**

Although limited, epidemiologic studies have suggested exercise may improve sleep quality.(1-3) However, there is even less data concerning whether the amount of physical activity has an impact on the prevalence of sleep disorders. In one such study performed in the TESOAD cohort, we demonstrated that a modest amount of physical activity was associated with a reduction in the risk of having symptoms of disturbed sleep, particularly those indicative of insomnia.(4) In addition, a borderline association between physical activity and excessive daytime sleepiness was observed.(4) However, polysomnographic data were not available and thus it is not clear whether this association could be attributable to sleep disordered breathing (SDB). Recently, Peppard and Young published a paper using data from the Wisconsin Sleep Cohort demonstrating that independent of body habitus, lesser amounts of planned exercise were associated with a greater risk of having SDB.(5) However, the Wisconsin Sleep Cohort is comprised of a middle-aged, principally Caucasian population. In addition, assessment of exercise was limited to responses from a single question concerning planned regular exercise. Additional analyses utilizing a population with greater ethnic and age diversity would not only confirm these findings, but determine whether they were more generalizable.

Several of the parent cohorts in SHHS obtained self-reported assessments of physical activity during their examination cycles. For some domains of physical activity, comparable data was obtained from almost every cohort such as city blocks walked and regular vigorous activity (Table 1). Thus, it appears feasible to use these data and polysomnographic data from SHHS-1 to determine if there is an association between level of physical activity and SDB after adjustment of

several confounders. Preliminary analysis of data from the TESOAD cohort (Table 1) indicate that regular, vigorous exercise is associated with a decrease in prevalence of SDB (38.6% vs. 52.1%,  $p=.019$ )

**5. HYPOTHESES**

- 1) Physical activity decreases with increasing respiratory disturbance index;
- 2) This association is attenuated, but not nullified, after adjustment for BMI, age and cardiopulmonary disease.

**6. DATA [VARIABLES, TIME WINDOW, SOURCE, INCLUSIONS/EXCLUSIONS]**

To some degree, physical activity was assessed in the TESOAD, SHS, FHS, ARIC and CHS between the years 1989-95 which is up to 6 years before the start of SHHS (Table 1). Dependent variables will be several questionnaire items assessing self-reported physical activity. Although not every "domain" of physical activity was ascertained in each cohort, for a number "domains" such as city blocks walked and regular vigorous activity (Table 1, comparable data appear to be available for 2 or more cohorts. These variables will be combined as appropriate to develop indices of physical activity. The primary independent variables will be the respiratory disturbance index (RDI4%) collected during SHHS-1 (1995-1997). Covariates to be considered are age, gender, field center, body-mass index, prevalent cardiovascular disease, hypertension, diabetes, obstructive lung disease (defined by FEV1/FVC ratio) and smoking status. Data analysis will be conducted on all TESOAD, SHS, FHS, ARIC and CHS subjects participating in SHHS-1 who have PSG data available and have data pertaining to physical activity.

**7. TYPE OF STUDY: Secondary**

**8. TYPE OF PUBLICATION: Manuscript**

**TARGET JOURNAL: Chest**

**9. ANALYSIS RESPONSIBILITY: Local**

**10. BRIEF ANALYSIS PLAN [include list of variables to be used, time frame of data, source of non-SHHS data, and probable statistical methods]**

**INDEPENDENT VARIABLES: RDI4%**

**DEPENDENT VARIABLES: Physical Activity variables (Table 1)**

**COVARIATES:** age, gender, field center, BMI, prevalent CVD, hypertension, diabetes, obstructive lung disease (defined by FEV1/FVC ratio) and smoking status

**PROBABLE STATISTICAL METHODS:** tabular methods, multiple logistic regression, multiple linear regression

## 11. REFERENCES

1. **Vuori I, Urponen H, Hasan J, Partinen M.** Epidemiology of exercise effects on sleep. *Acta Physiol Scand Suppl.* 1988;574:3-7.
2. **Urponen H, Vuori I, Hasan J, Partinen M.** Self-evaluations of factors promoting and disturbing sleep: an epidemiological survey in Finland. *Soc Sci Med.* 1988;26(4):443-50.
3. **Hasan J, Urponen H, Vuori I, Partinen M.** Exercise habits and sleep in a middle-aged Finnish population. *Acta Physiol Scand Suppl.* 1988;574:33-5.
4. **Sherrill DL, Kotchou K, Quan SF.** Association of physical activity and human sleep disorders. *Arch Intern Med.* 1998;158(17):1894-8.
5. **Peppard PE, Young T.** Exercise and sleep-disordered breathing: an association independent of body habitus. *Sleep.* 2004;27(3):480-4.

**Table 1: Association of Sleep Disordered Breathing (RDI3%  $\geq$  10) with Regular Vigorous Exercise in the TESOAD**

Crosstab					
			sweat or heart thumping		Total
			Yes	No	
RDI10	.00	Count	113	69	182
		Expected Count	102.1	79.9	182.0
		% within RDI10	62.1%	37.9%	100.0%
		% within sweat or heart thumping	61.4%	47.9%	55.5%
		% of Total	34.5%	21.0%	55.5%
	1.00	Count	71	75	146
		Expected Count	81.9	64.1	146.0
		% within RDI10	48.6%	51.4%	100.0%
		% within sweat or heart thumping	38.6%	52.1%	44.5%
		% of Total	21.6%	22.9%	44.5%
Total		Count	184	144	328
		Expected Count	184.0	144.0	328.0
		% within RDI10	56.1%	43.9%	100.0%
		% within sweat or heart thumping	100.0%	100.0%	100.0%
		% of Total	56.1%	43.9%	100.0%



**Table 2: Exercise Components for SHHS Parent Studies**

<b>Question</b>	<b>TESOAD</b>	<b>Framingham</b>	<b>SHS</b>	<b>ARIC</b>	<b>CHS</b>
Flights of Stairs	X	X		X*	X
City Blocks Walked	X	X	X*	X*	X
Pace of Walking	X				X
Sports/Recreation	X		X	X	X
Formal Exer Prog	X				
Time @ Var Exer Intensities	X				
Regular Vigorous Exercise	X	X	X	X	
Change in Phys Activity	X				X
Time Frame	90-92	91-95	89-91,93-95	93-95	92-93
Exam Cycle	Survey 12	Offspring 5	Phase 1,2	Exam 3	Year 5

\*May require calculations/extrapolations