



Vanderbilt Bill Wilkerson Center

Examining Fatigue in Children and Adults with Hearing Loss

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Acknowledgements

■ Faculty collaborators

- Dan Ashmead
- Fred Bess
- Stephen Camarata
- Aaron Kipp
- Sasha Key

■ Lab Group(s) members

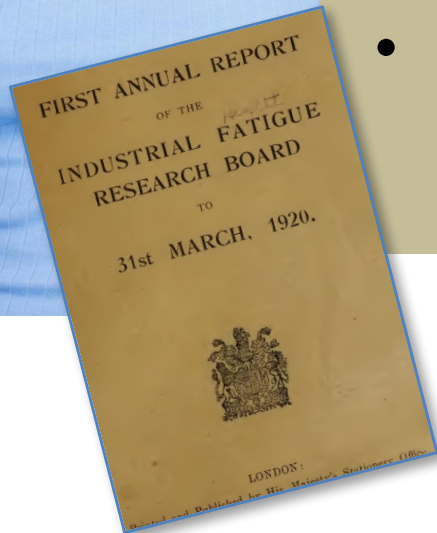
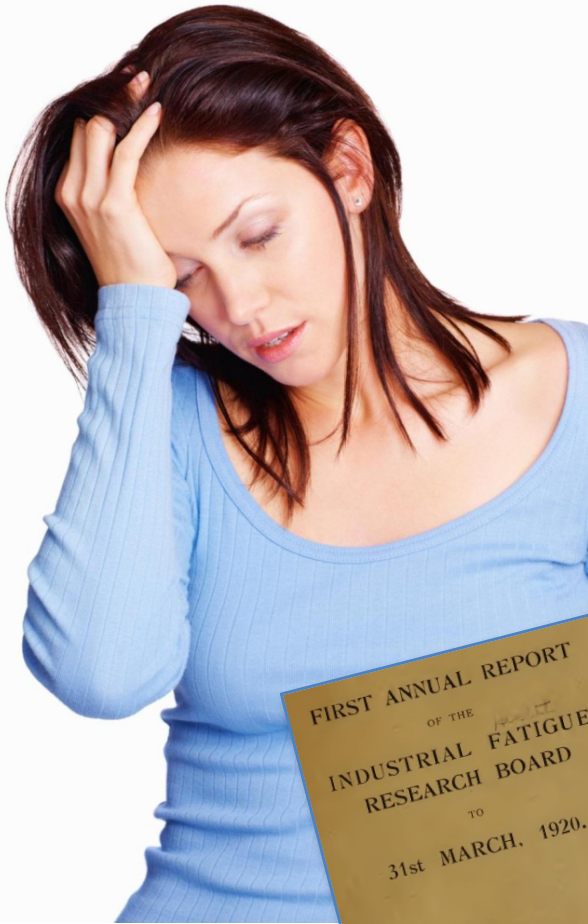
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Defining fatigue

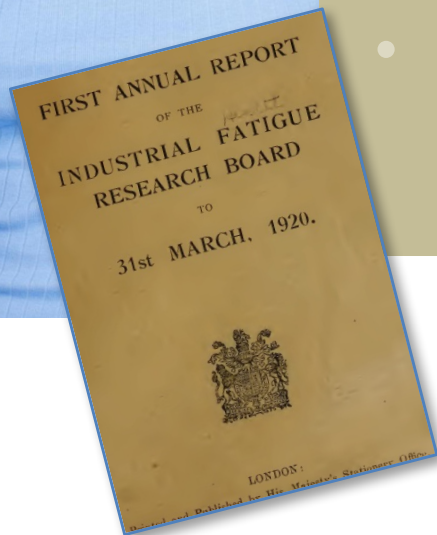


- Fatigue is a complex construct- no universally accepted definition exists
 - Occurs in the physical and mental domains
- **Subjective fatigue** is an ongoing “state”, a mood or feeling of tiredness, exhaustion or lack of energy
- **Behavioral (Cognitive) fatigue** is an outcome, a decrement in performance
 - Physical or mental performance

“[I recommend] that the term fatigue be absolutely banished from precise scientific discussion”.

----Muscio (1921)

Defining fatigue

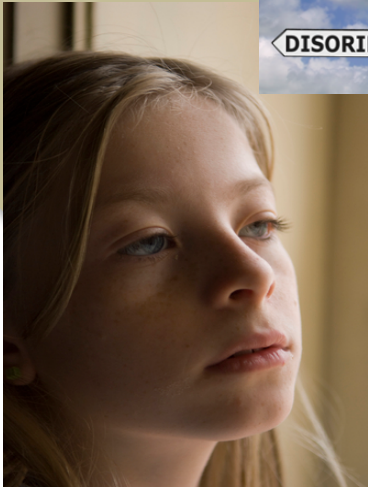


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Consequences of recurrent, severe, fatigue



Adults—

- Stress, inattention, concentration, mental processing, and decision-making
- less productive and more prone to accidents
- less active, more isolated, less able to monitor own self-care

Children w/ Chronic Illnesses—

- inattention, concentration, distractibility
- poorer school achievement, higher absenteeism

Amato, et al. 2001; van der Linden et al. 2003; DeLuca, 2005; Eddy and Cruz, 2007; Ricci et al. 2007

Hearing Loss, Listening Effort and Fatigue- Adult & Child experiences



“I go to bed most nights with nothing left. It takes so much energy to participate in conversations all day, that I’m often asleep within minutes.”

– Adult with long-standing profound hearing loss

“Listening IS exhausting!!!”

- Adult with hearing loss



“My brain needs a rest from listening.”

- Students with hearing loss

“Trying harder to listen and understand drains me and makes me feel down.”

- Student with hearing loss

“My child will zone out or go into a bubble when she needs a break from listening.”

- Parent of a child with hearing loss



“First thing I do when I get home is take my hearing aids out. I just need a break.”

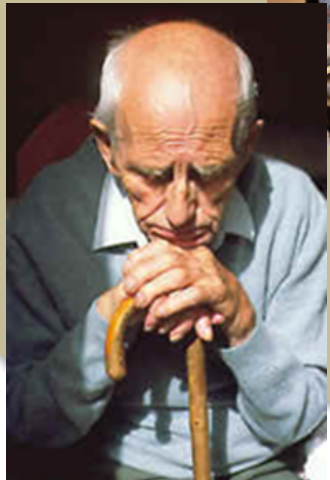
- Student with hearing loss

“My child will withdraw at the end of a long day of listening.”

- Parent of a child with hearing loss



Is fatigue a problem for people with hearing loss?

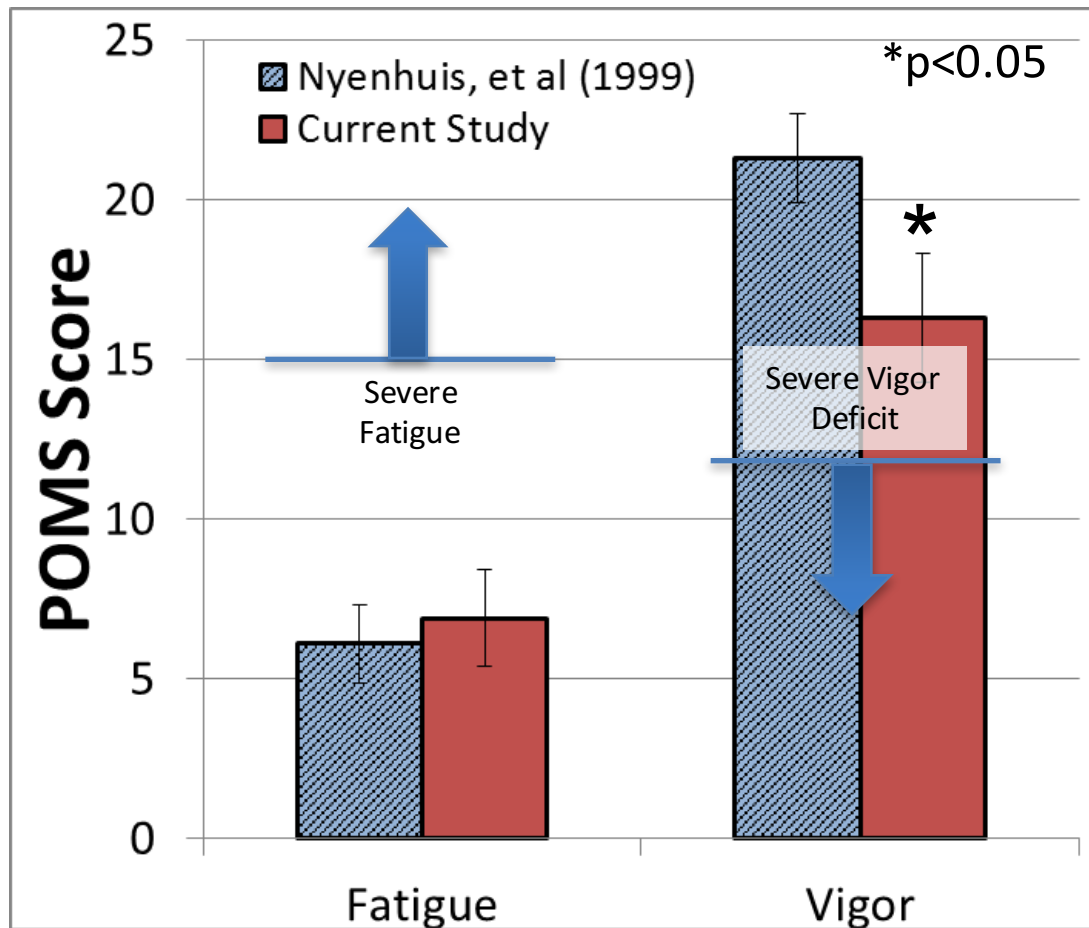


- **Anecdotal reports suggest yes!**
- **Qualitative research has provided ancillary support for these reports**
 - Hetu et al., 1988; Kramer et al. 2006; Nachtegaal et al. 2009
- **But very little systematic research has focused on this topic**
 - Until recently, none have used validated measures

Study Questions

- Is subjective fatigue a problem for people with hearing loss?
 - Using validated, generic, measures are problems of fatigue or vigor deficits increased in adults (AHL) or children with HL (CHL)?
 - If so, what factors modulate their fatigue?
- Let's start with adults-

Subjective fatigue in adults with HL



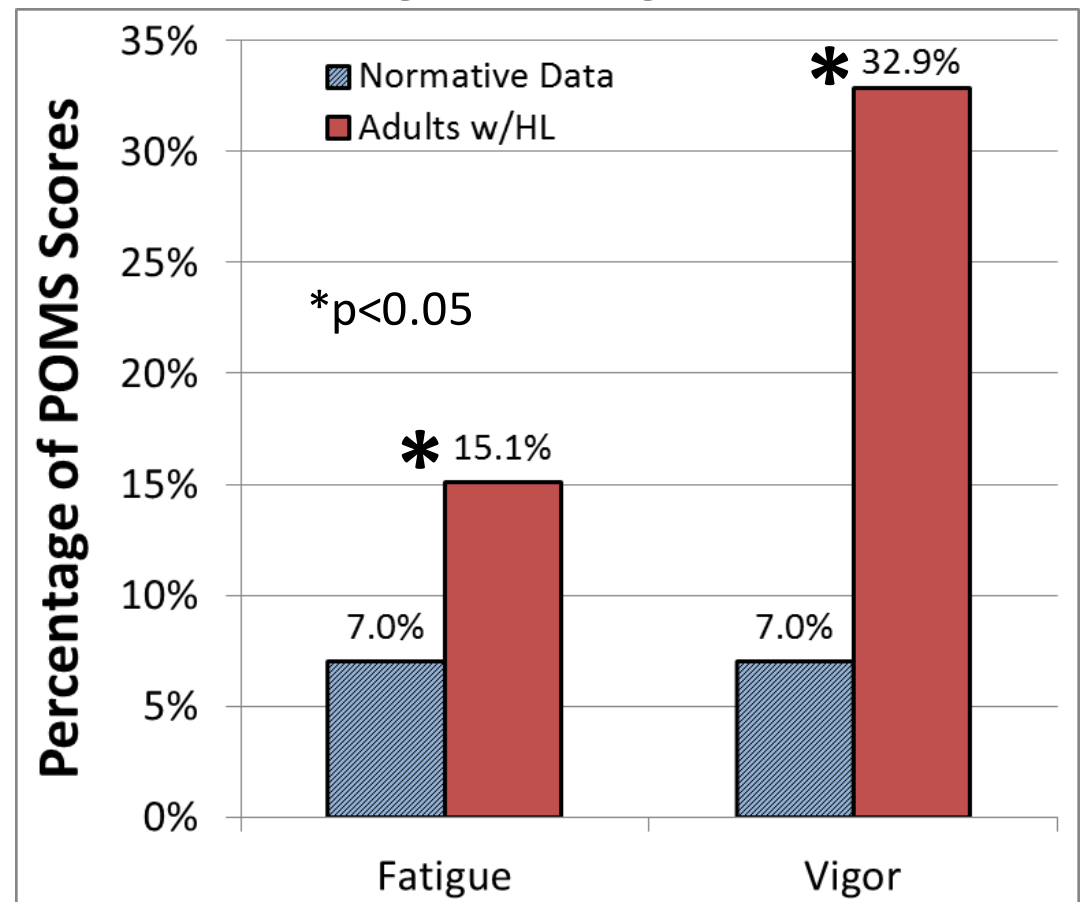
- Compared to POMS normative data, older adults seeking help for HL report
 - similar fatigue but
 - significantly lower vigor

- Age range: 55-94 years
- N= 116

HI adults are at increased risk for severe fatigue and vigor deficits

- More than 2 times as likely to report severe fatigue and
- More than 4 times as likely to report severe vigor deficits!
- Severe = >1.5 st. dev. above mean

Percentage of adults subjectively reporting severe fatigue and vigor deficits



Hornsby, B. & Kipp, A. (2016)

Subjective fatigue in adults with HL

- Study Questions: Hornsby, B. & Kipp, A. (2016)
 - Using validated, generic, measures are problems of fatigue or vigor deficits increased in adults with HL (AHL)? **[Yes, partly- esp. severe]**

Subjective fatigue in adults with HL

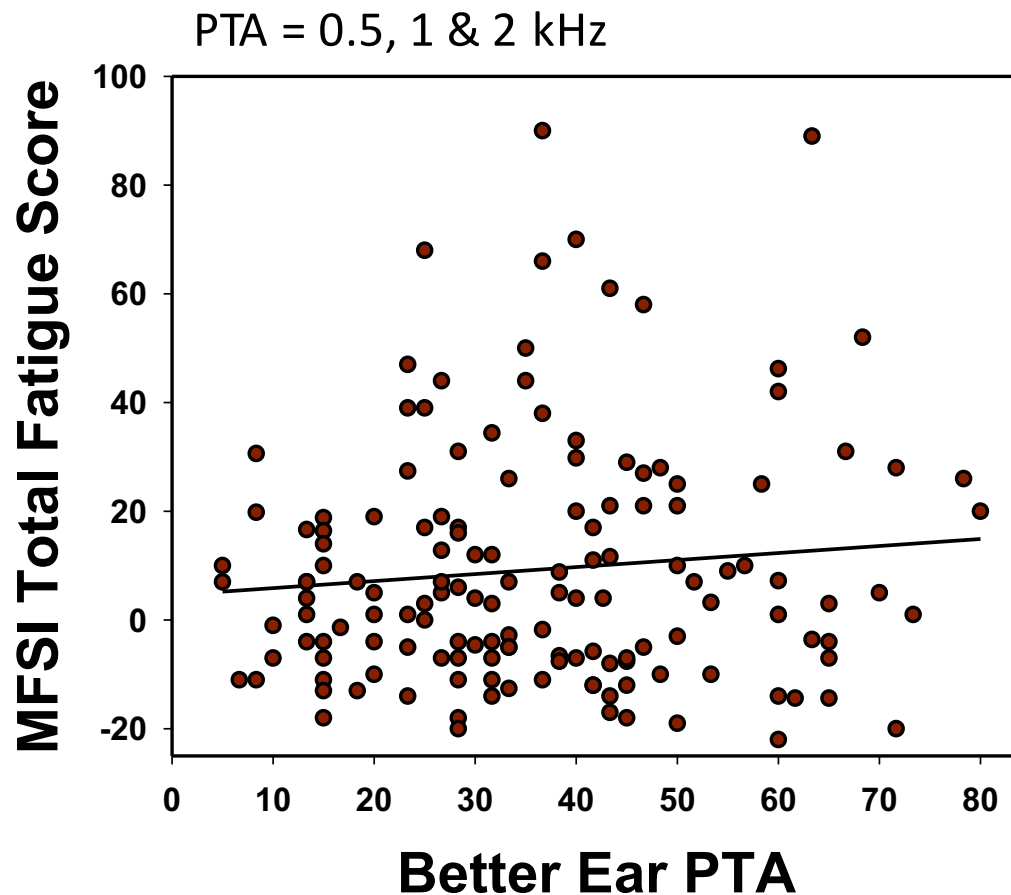
- Study Questions:

Hornsby, B. & Kipp, A. (2016)

- Using validated, generic, measures are problems of fatigue or vigor deficits increased in adults with HL (AHL)? [Yes, partly- esp. severe]
- What factors modulate fatigue in AHL?
 - Objective hearing difficulty (PTA)?

Degree of hearing loss and fatigue

Hornsby, B. & Kipp, A. (2016)



- Surprisingly, **no association** bw degree of loss and any fatigue/vigor domain
 - Similar result for POMS data as well

- N= 143
- Age range: 22-94 years
- PTAs: 5-80 dB (Median: 33 dB)

MFSI= Multidimensional fatigue symptom inventory- short form

Subjective fatigue in adults with HL

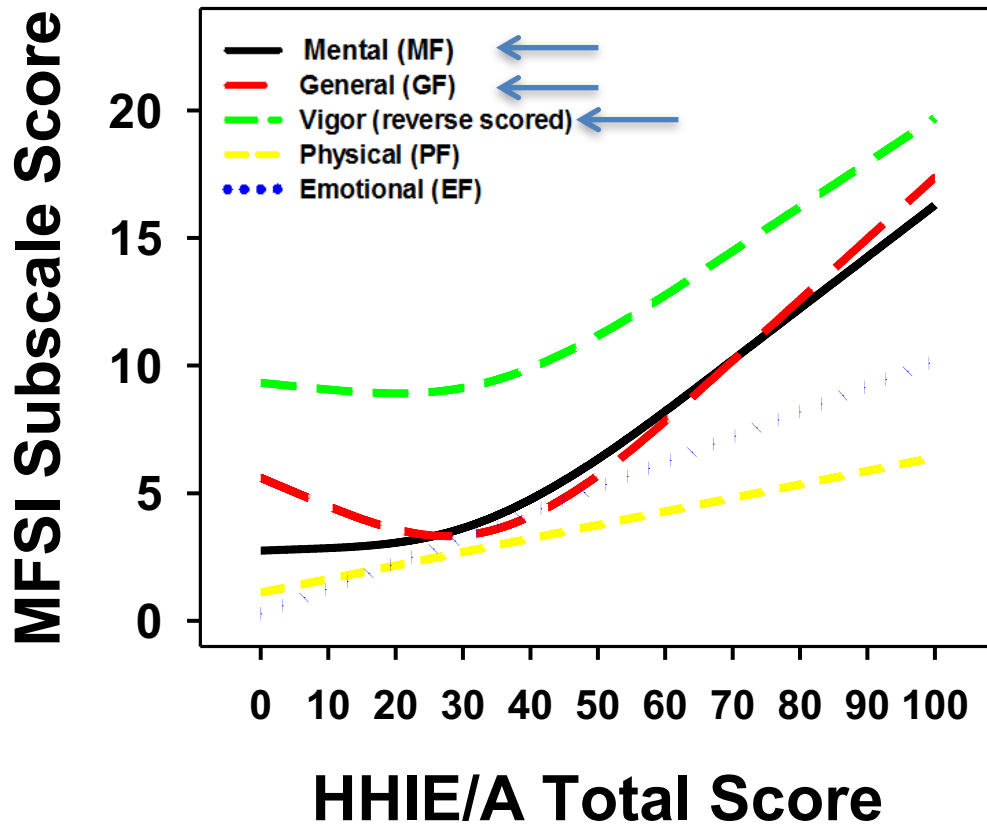
- Study Questions:

Hornsby, B. & Kipp, A. (2016)

- Using validated, generic, measures are problems of fatigue or vigor deficits increased in adults with HL (AHL)? **[Yes, partly- esp. severe]**
- What factors modulate fatigue in AHL?
 - Objective hearing difficulty (PTA)? **[No!]**
 - Perceived hearing difficulty (HHIE/A)?

Hearing handicap and fatigue

Hornsby, B. & Kipp, A. (2016)



- Fatigue increases with increases in hearing handicap
- Esp. for “significant” handicap scores (HHIE/A scores >42)
 - Limited association for lower handicap scores

- Strong relationship between high levels of hearing handicap and subjective fatigue

Take Home Points- Adults

- Generic fatigue measures suggest, in everyday settings
 - Fatigue and vigor deficits are increased in at least a subset of adults with HL,
 - Especially risk for more severe fatigue and vigor deficits
- This increased risk is not associated with PTA
 - But is associated with perceived hearing difficulties (i.e., psychosocial consequences of hearing loss- HHIE/A scores)



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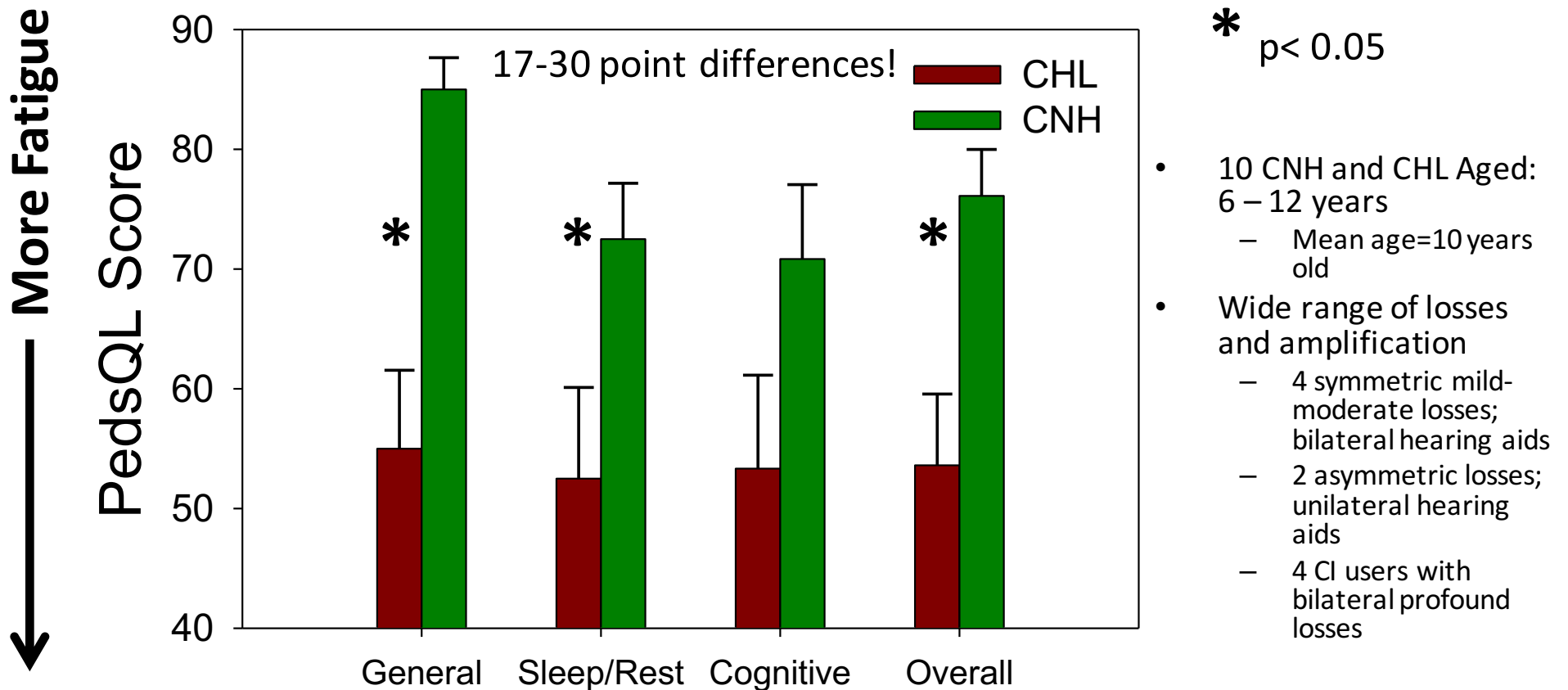


What about kids with hearing loss?



Preliminary Results (n=10/group)

PedsQL-MFS: Pediatric Quality of Life-
Multidimensional Fatigue Scale (Varni et al., 2002)

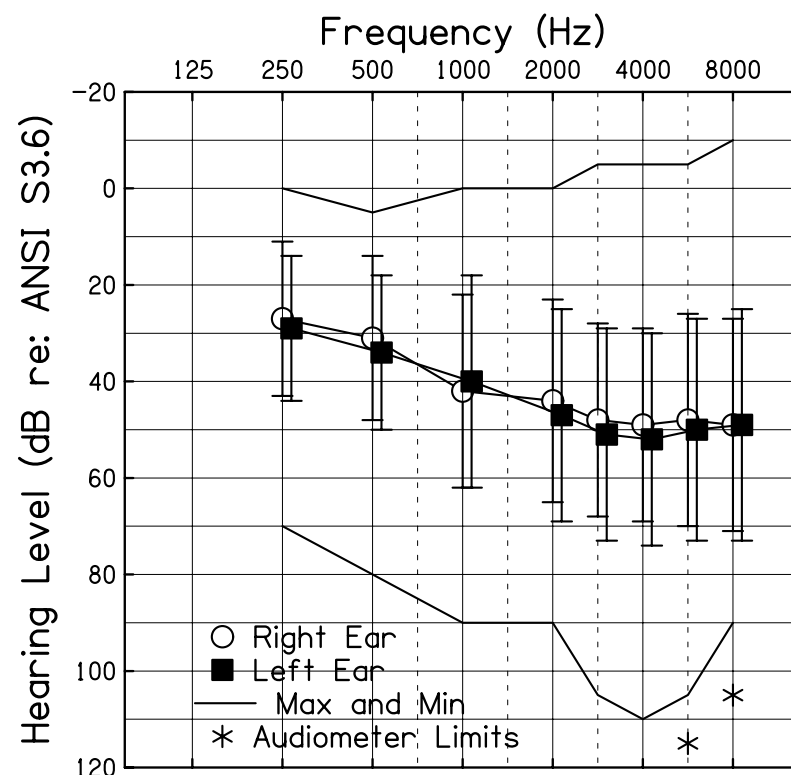


- CHL reported significantly more fatigue. Pervasive across domains

Hornsby, et al., (2014)

Full Data Set: Participants

- Participants
 - CNH and CHL (6-12 years old)
 - and their parents
 - Bilateral, mild to moderately-severe, permanent hearing loss
- Inclusion/Exclusion:
 - No cochlear implant users
 - General education classroom
 - Monolingual English speakers
 - No diagnosis of cognitive impairment, autism or developmental disorder
- Experimental group (**n=60**)
 - 31 males (52%), 29 females
 - Age = 10.0 (1.9) years



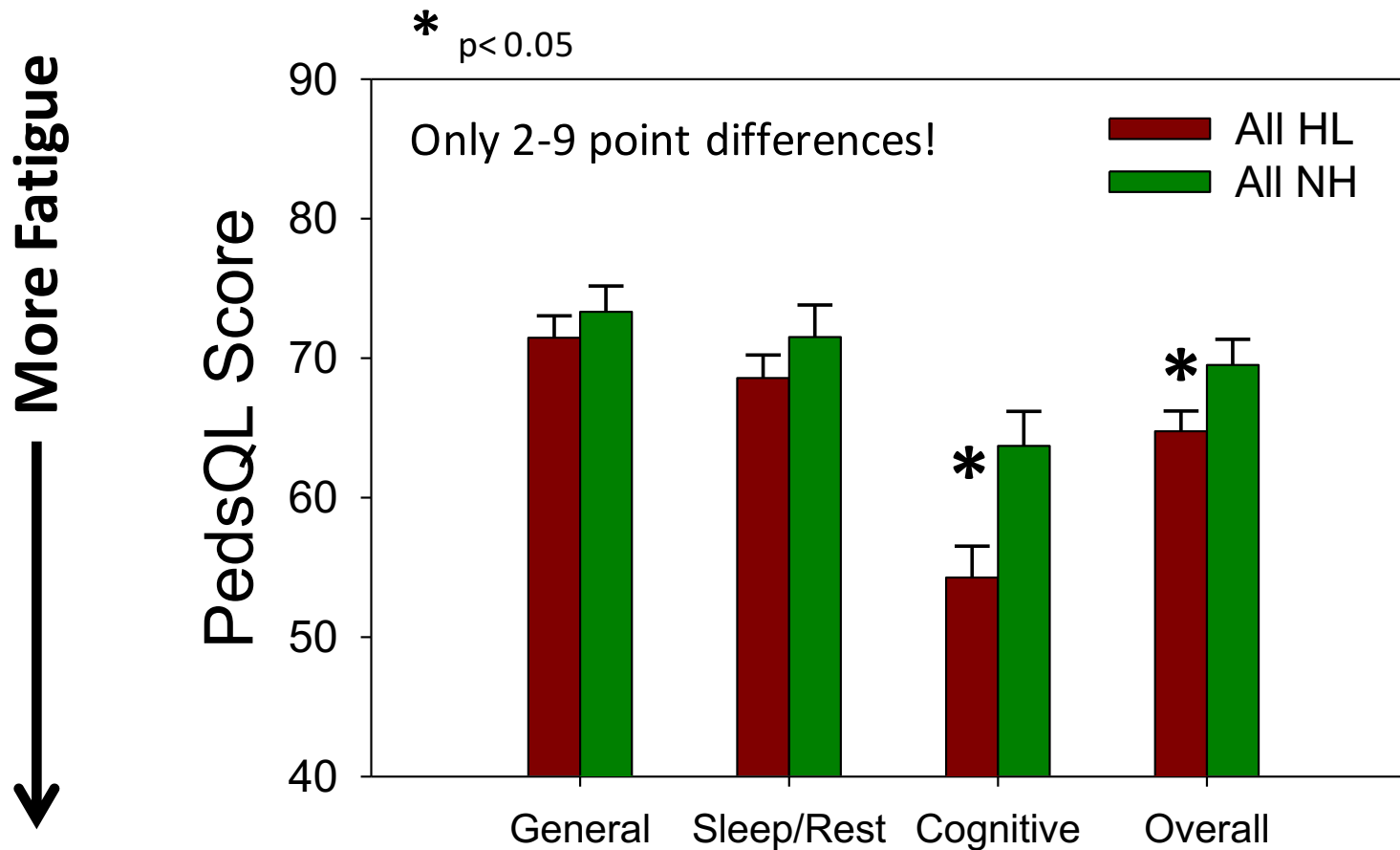
- Control Group (**n=43**)
 - 26 males (60%), 17 females
 - Age = 9.1 (2.3) years

Full Data Set: Analyses

- Child and parent data analyzed using mixed model ANOVAs and a correlation approach
 - Examined group effects
 - Hearing loss vs No hearing loss
 - Parent vs child report
 - Examined factors associated with individual variability in fatigue ratings
 - Better ear-PTA, measures of language (CELF), receptive vocabulary (PPVT) and non-verbal intelligence (TONI)

Effect of Hearing Loss

Mean data collapsed across parent/child reports

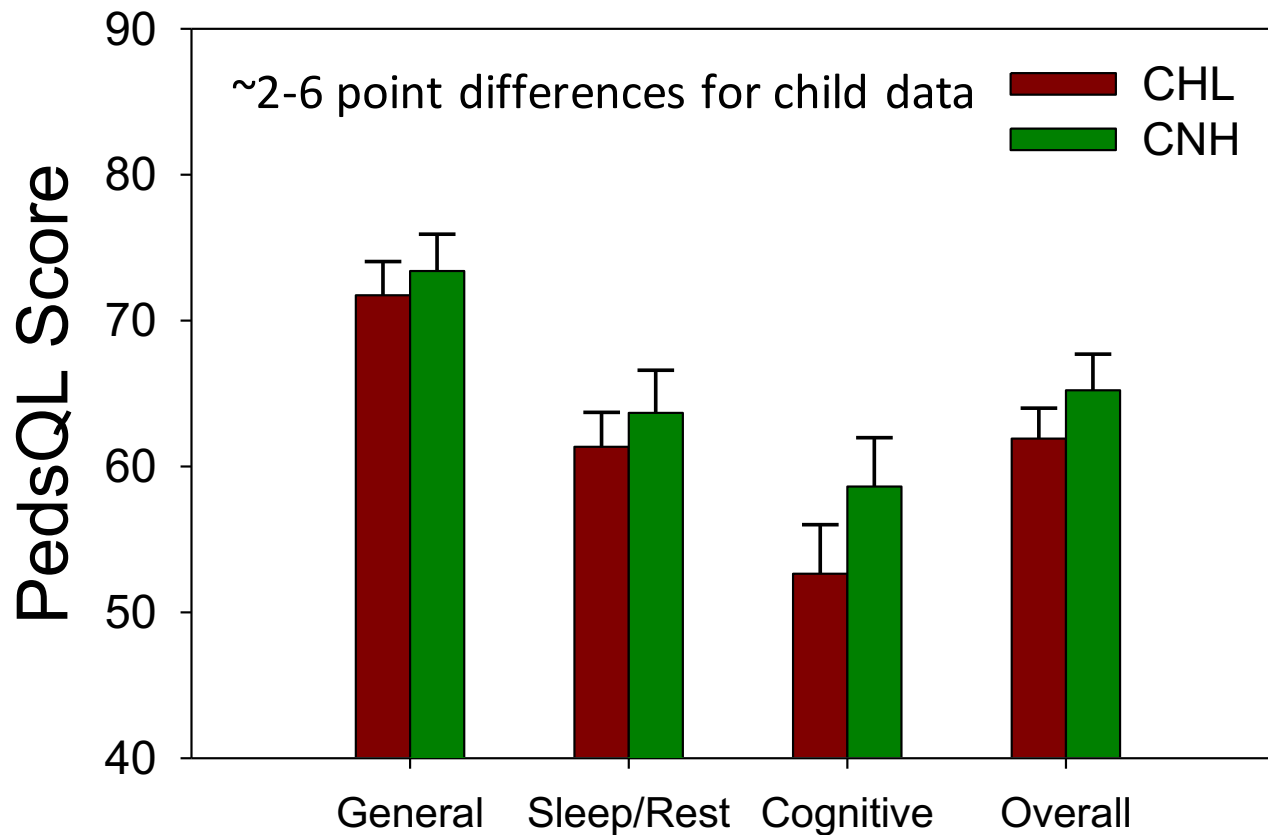


- Current data shows main effect of HL but much smaller effects
 - No interaction with Parent/Child report

Effect of Hearing Loss

Mean child report- Full data set

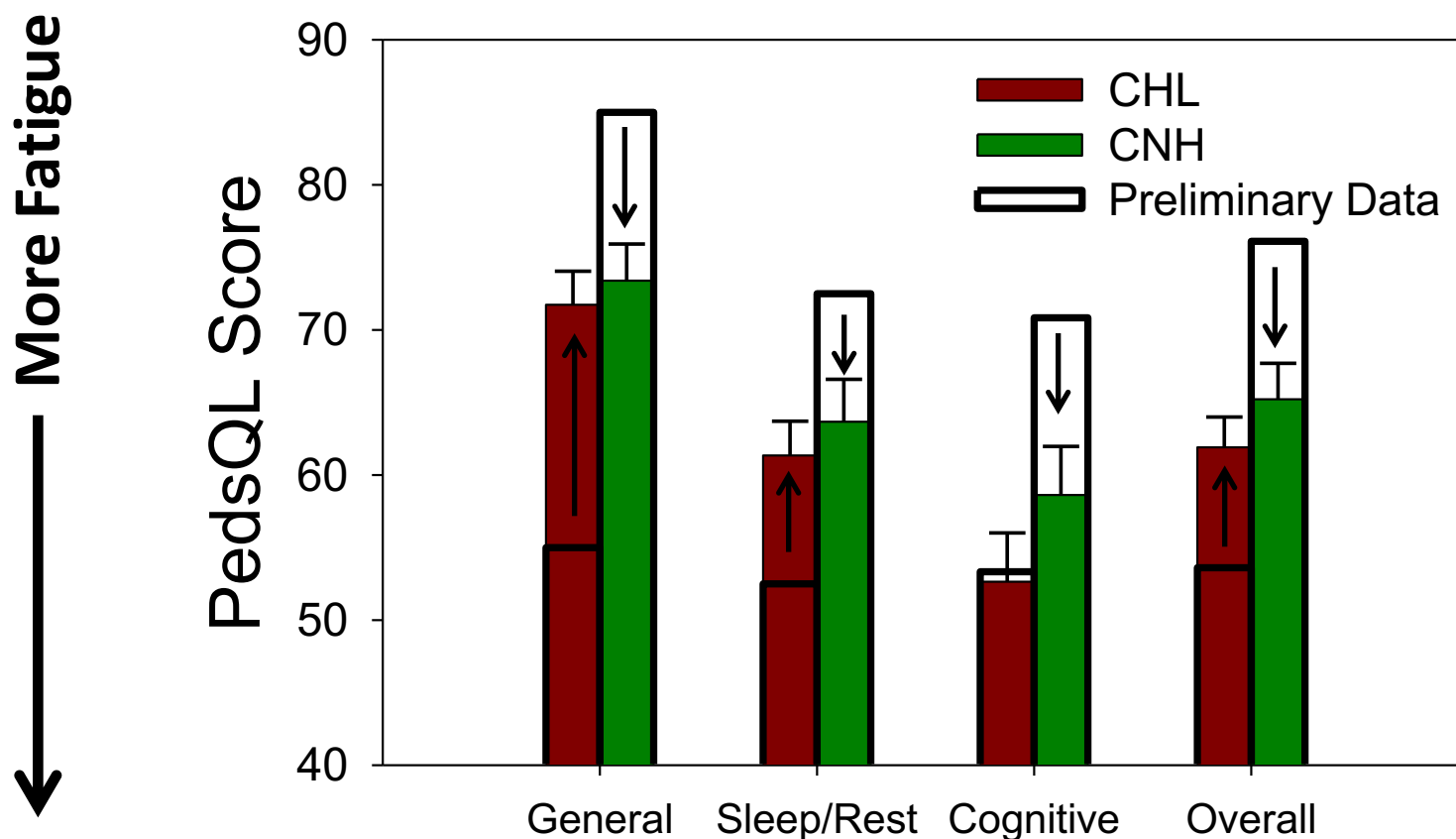
More Fatigue
↓



- Current data shows main effect of HL but much smaller effects
 - No interaction with Parent/Child report

Why the smaller effect of hearing loss?

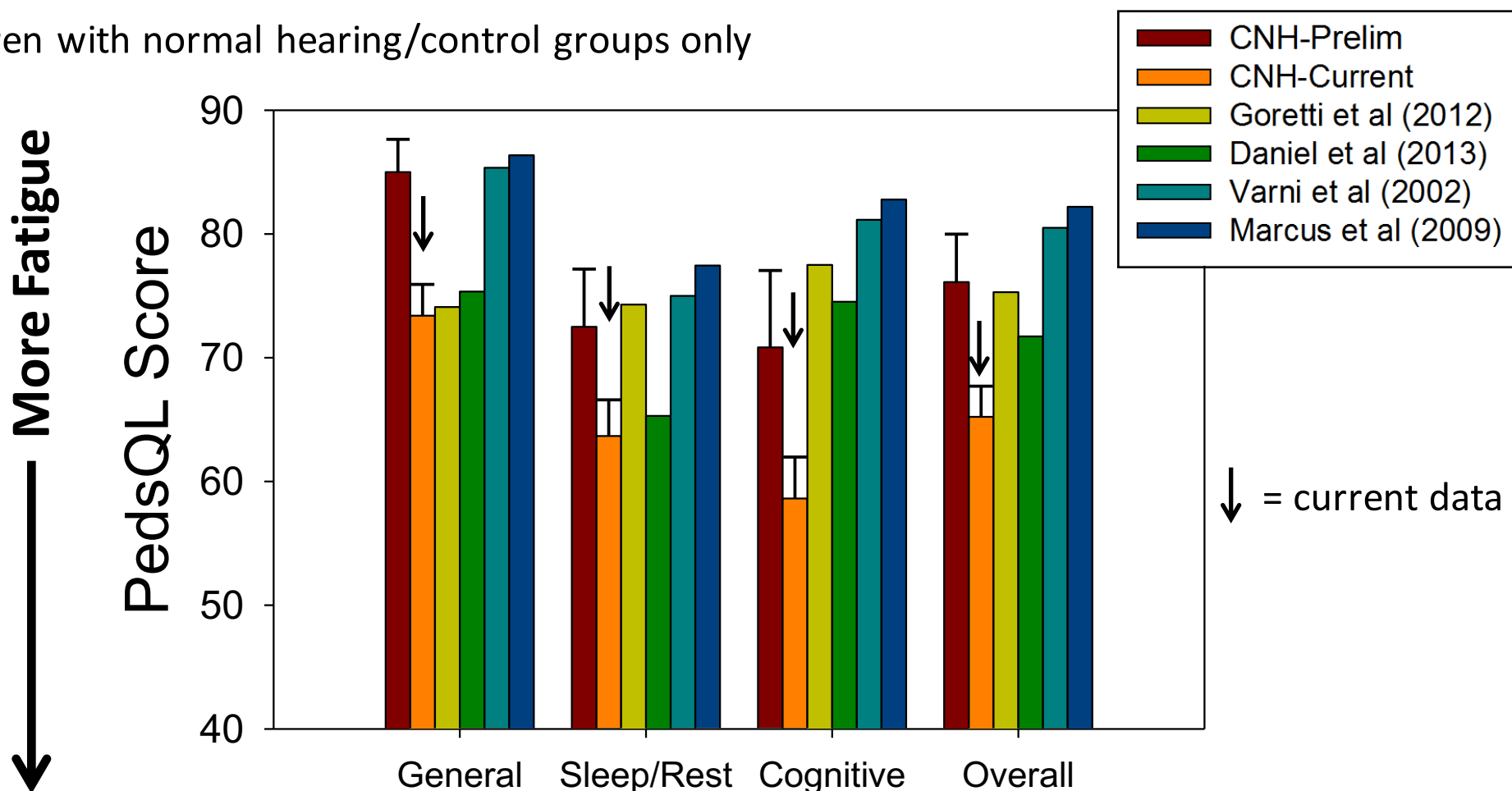
Child data only; preliminary data and full data set



- Differences reflect less fatigue in children with HL and more fatigue in our normal hearing children

Our CNH report high fatigue?- Yes

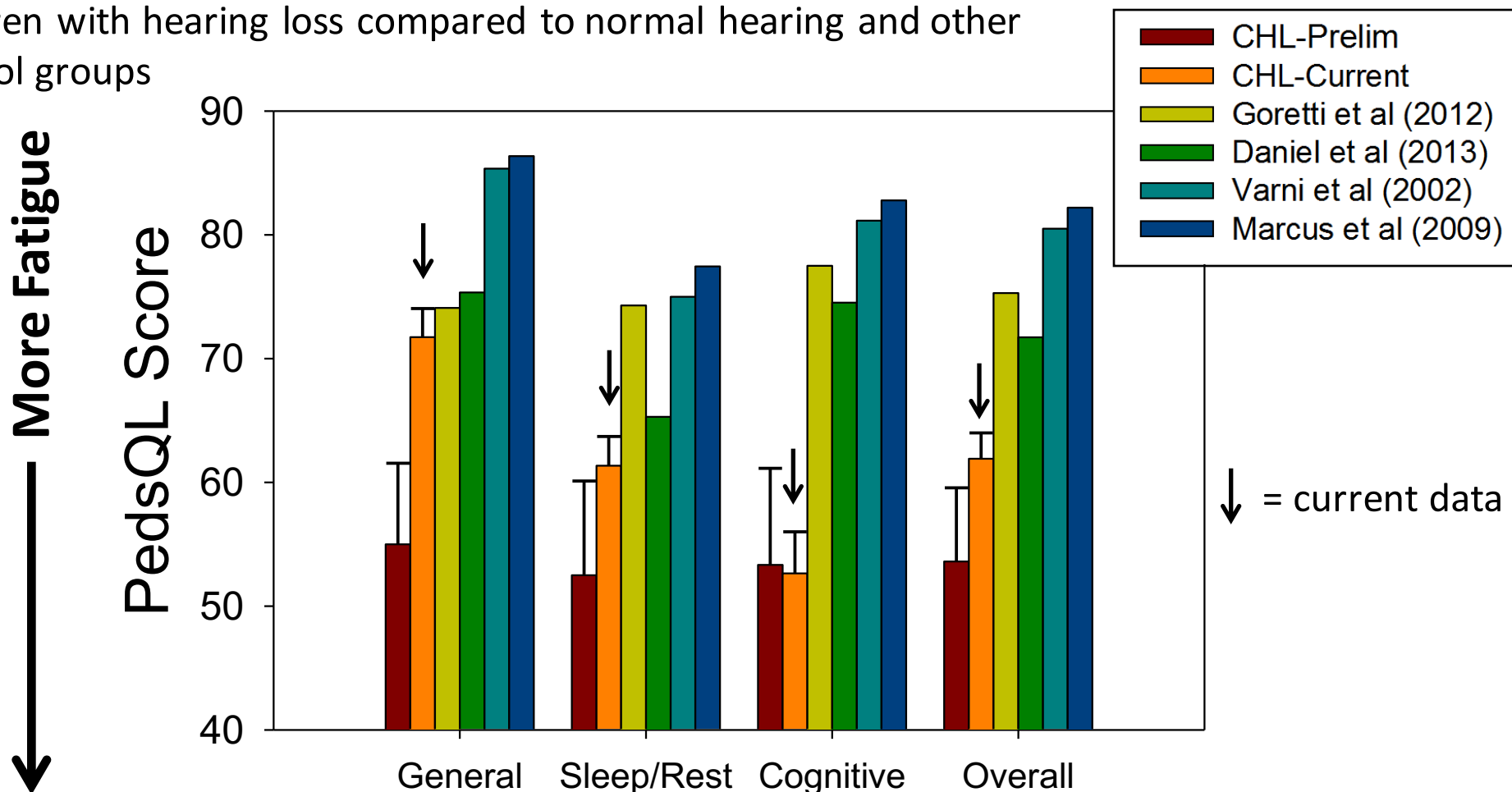
Children with normal hearing/control groups only



- Compared to prior data our current control group reports **more**, or similar, fatigue across multiple domains

Our CHL report less fatigue?- No

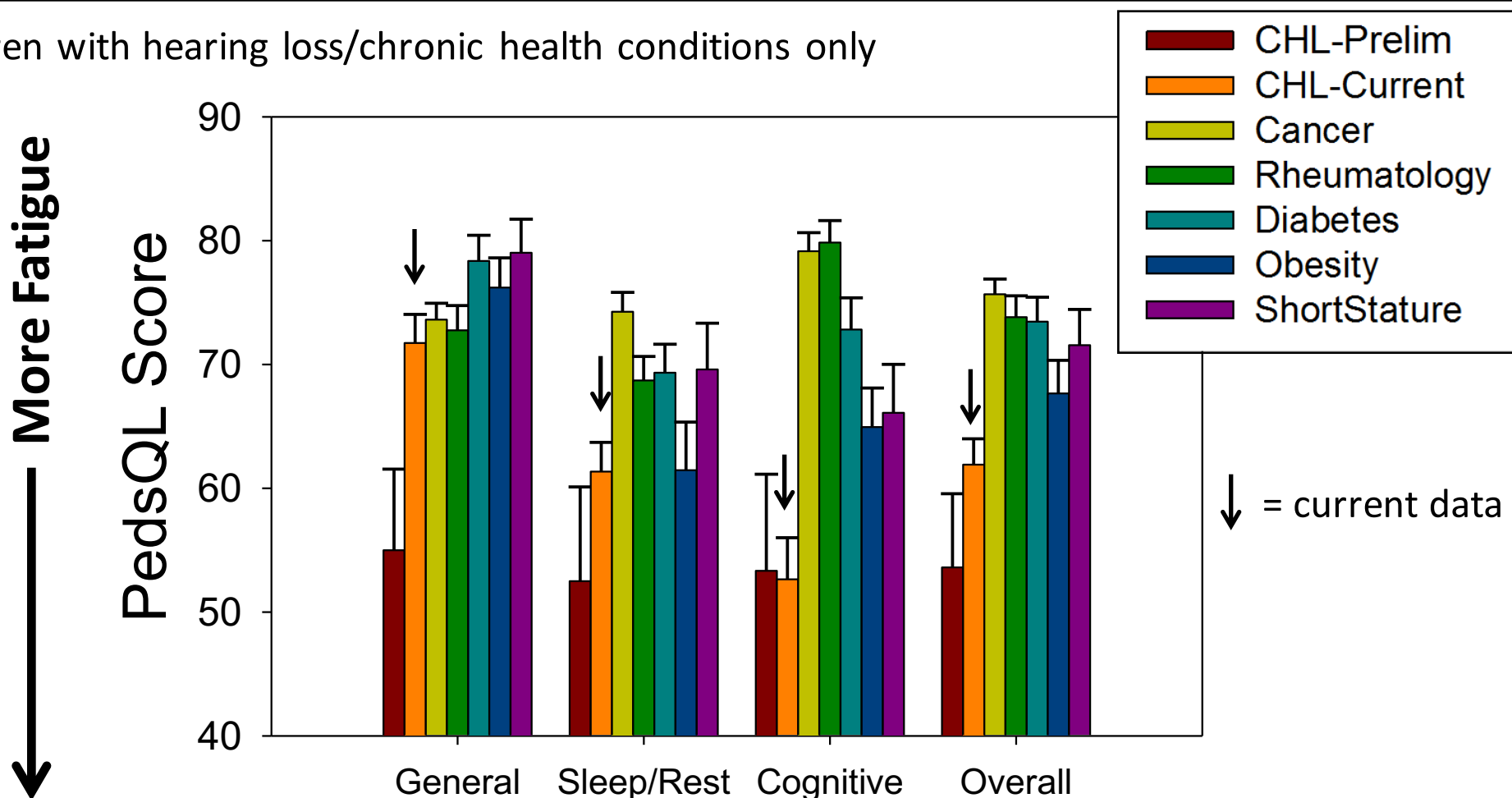
Children with hearing loss compared to normal hearing and other control groups



- Compared to prior data our current control group reports more, or similar, fatigue across multiple domains

Our CHL report less fatigue than other chronic conditions?- No

Children with hearing loss/chronic health conditions only

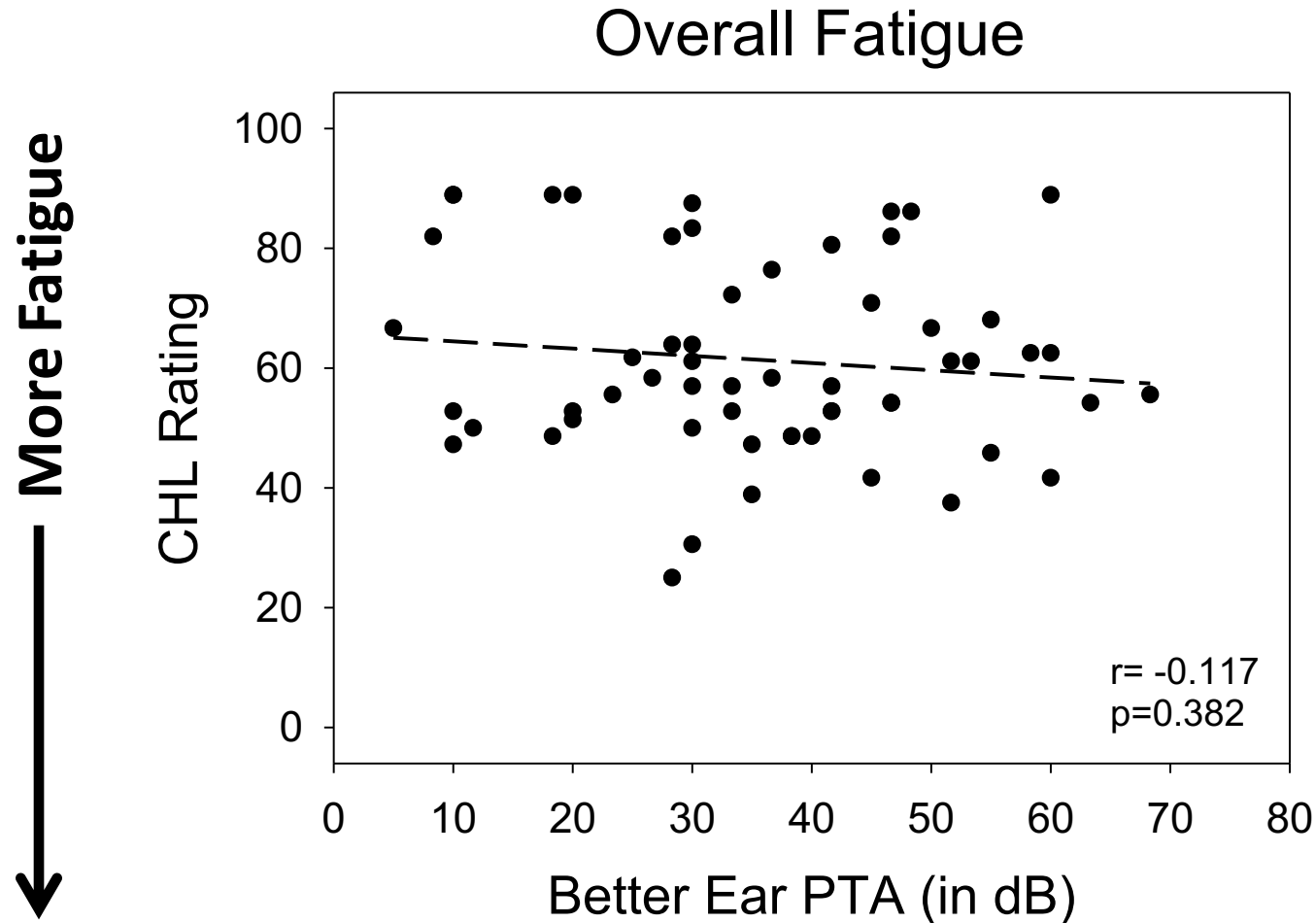


- Our current group reports less fatigue (except cognitive) than preliminary reports but **similar, or more, fatigue** compared to other chronic conditions

Factors influencing fatigue in CHL

- What factors modulate fatigue in CHL?
 - Degree of hearing loss (PTA)?
 - Intelligence, language or receptive vocabulary?
 - TONI, CELF, PPVT

Fatigue ratings are NOT associated with degree of hearing loss

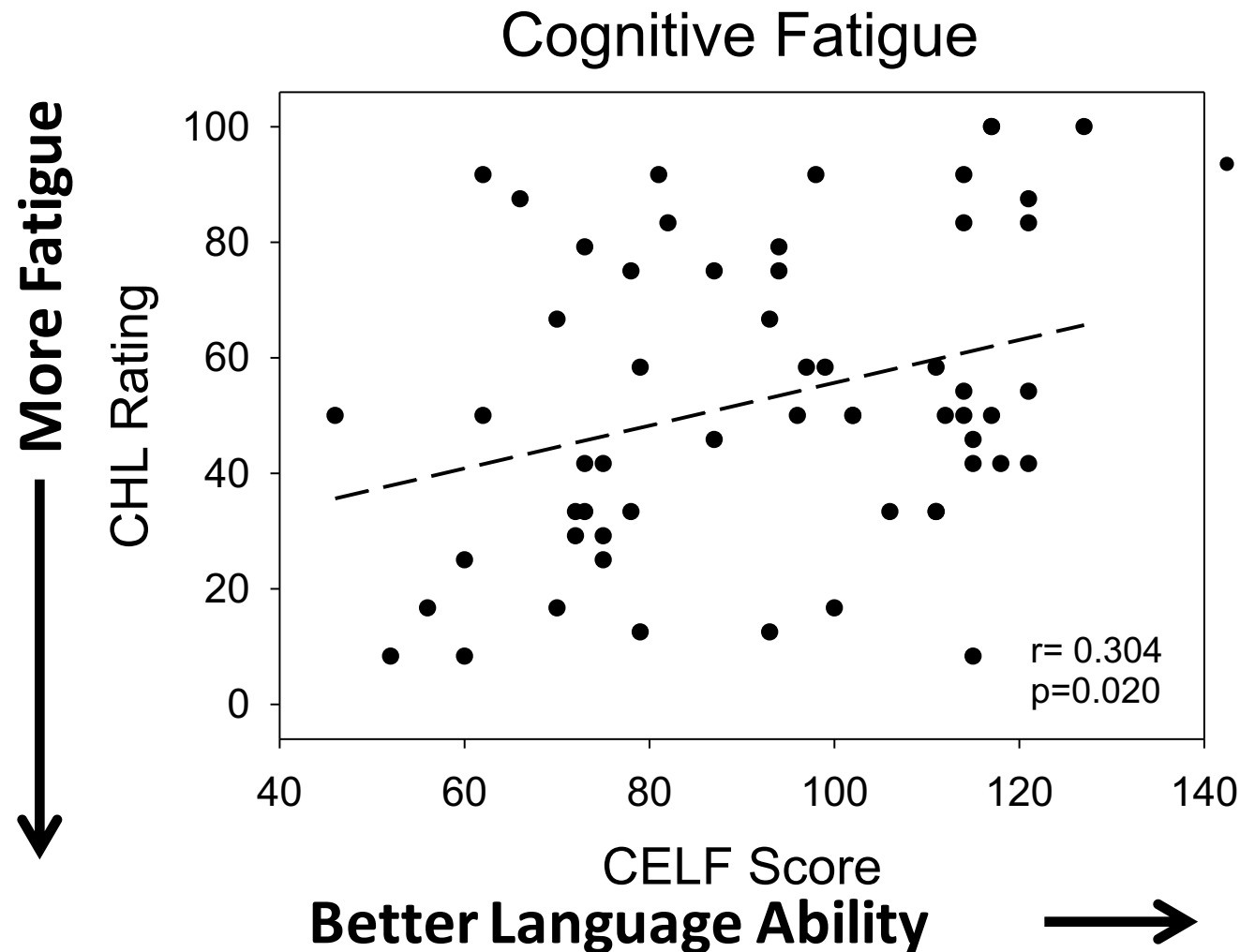


- No association between degree of loss and fatigue
 - Regardless of domain, or PTA measure; Same as adult data

Factors influencing fatigue in CHL

- What factors modulate fatigue in CHL?
 - Degree of hearing loss (PTA)? **[No!]**
- What about Intelligence (TONI), language (CELF) or receptive vocabulary (PPVT)?
 - No associations b/w general or sleep/rest fatigue and any measure (TONI, CELF or PPVT)
 - But significant associations b/w Cognitive fatigue and CELF and PPVT (but not TONI)
 - Similar for overall fatigue

Cognitive fatigue ratings ARE associated with language ability (CELF scores)



- Similar, but weaker, correlations seen for
 - CELF and Overall fatigue ($r=0.271$, $p=0.04$)
 - PPVT and Cognitive fatigue ($r=0.270$, $p=0.038$)

- Similar association b/w CELF and Cognitive Fatigue seen in CNH ($r=0.371$, $p=0.016$)



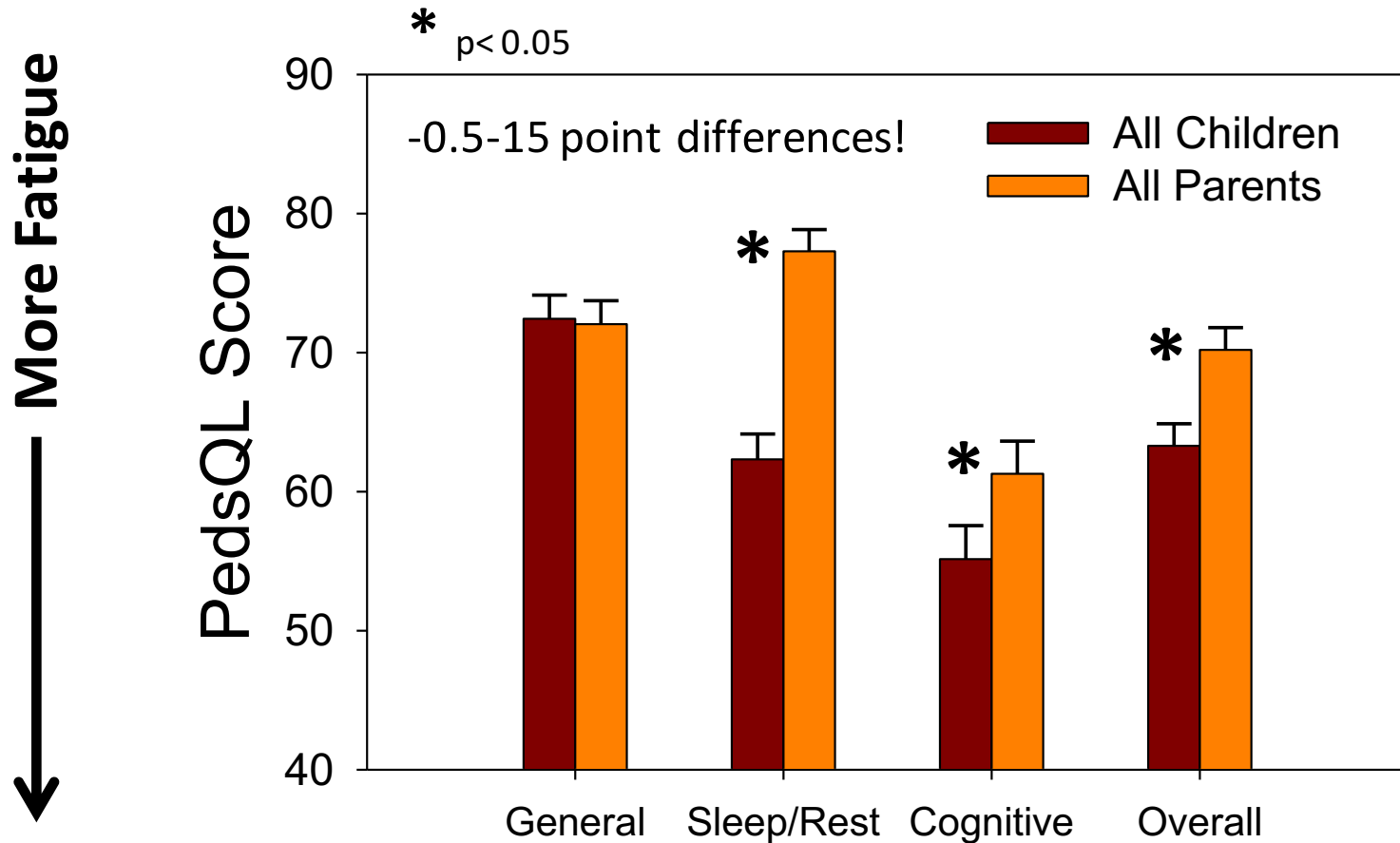
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Can a parents report be used as
a proxy for child ratings?

No... 😞

Effect of Parent/Child report

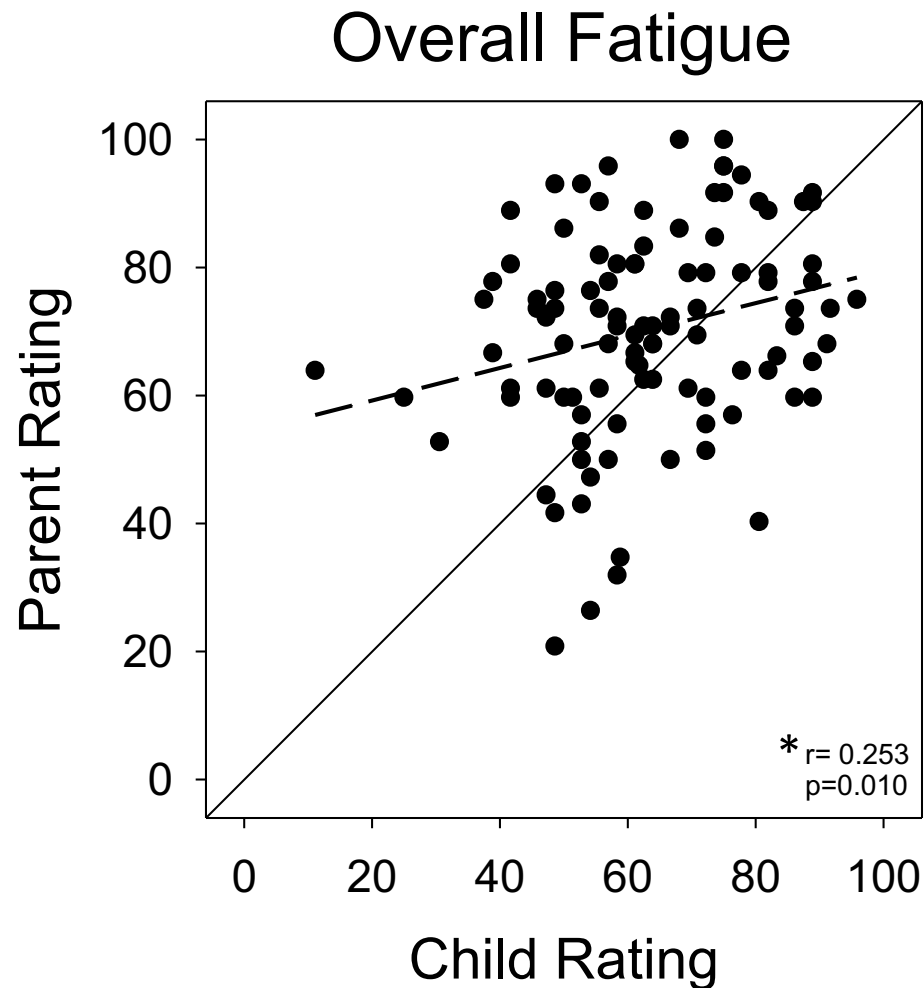
Mean data collapsed across HL/NH groups



- Parent reports generally suggest less fatigue than child reports

Parent-Child Correlations

- Correlations between parent and child ratings were weak (general, cognitive, overall), or not significant (Sleep/Rest)
 - Consistent with prior work in this area



*Similar, or poorer, correlations observed across all domains

Take Home Points- Children

- School-age children with mild-moderately severe HL
 - Experience more fatigue, especially cognitive fatigue, compared to control groups
 - Although, the magnitude is much less than seen in our prior report (i.e., Hornsby et al., 2014).
 - Their fatigue is comparable, or greater, than that reported by children with other chronic health conditions
- Higher fatigue ratings are
 - Are not modulated by degree of hearing loss
 - But are associated with poor language abilities (CELF scores), in both CHL and CNH
- Parent and child reports provide distinct information

Future Research: There is a lot we don't know!

- Better understand the “fatigue experience” of persons with HL
 - Do generic questionnaires (or lab studies) adequately capture the experiences of persons with HL?
- Develop/refine methods to quantify hearing loss- related stress, effort and fatigue
 - In laboratory and real world
- Characterize individual factors and physiologic mechanisms responsible for hearing loss- related fatigue
- Develop and directly test a model of hearing loss-related fatigue
 - Important for developing effective intervention strategies



Thanks for
Listening!

