



Youth Exposed to Caregiving Adversity Exhibit Altered Associations Between Diet and the Gut-Microbiome-Brain Axis

SRCD 2025

Gancz, N.N.*^{*}, Silvers, J.A., Choy, T., VanTieghem, M., Uhlemann, A-C., Park, H., Parr A., Callaghan, B.L.

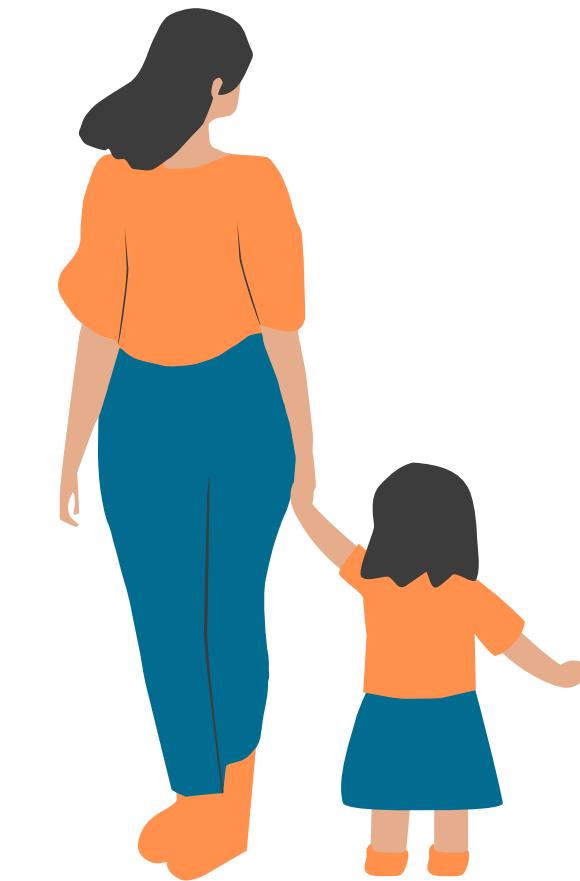


Increase in youth
internalizing symptoms

Wiens et al., 2020; Cipriani et al., 2016; Cuijpers et al., 2021; Juffer et al., 2005; Yap & Jorm 2015



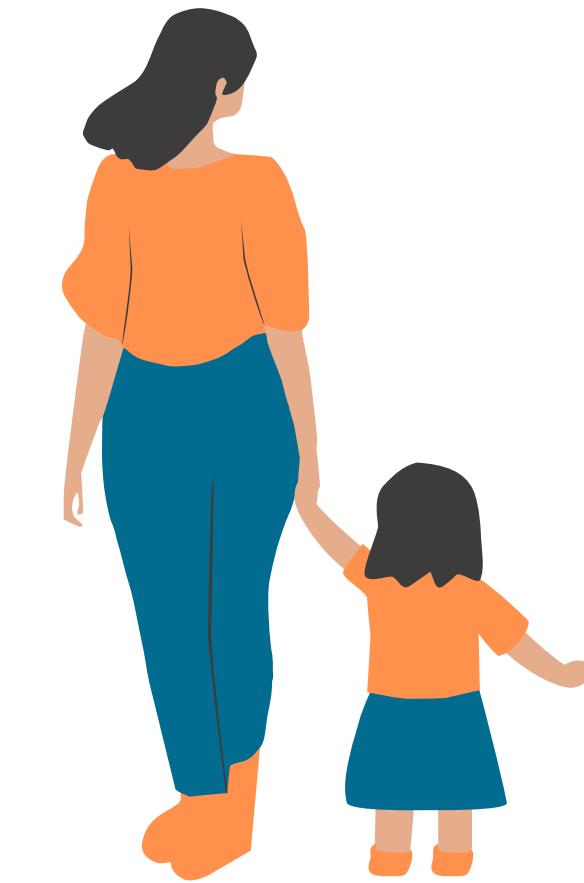
Increase in youth
internalizing symptoms



Especially following
interpersonal
adversity



Increase in youth
internalizing symptoms

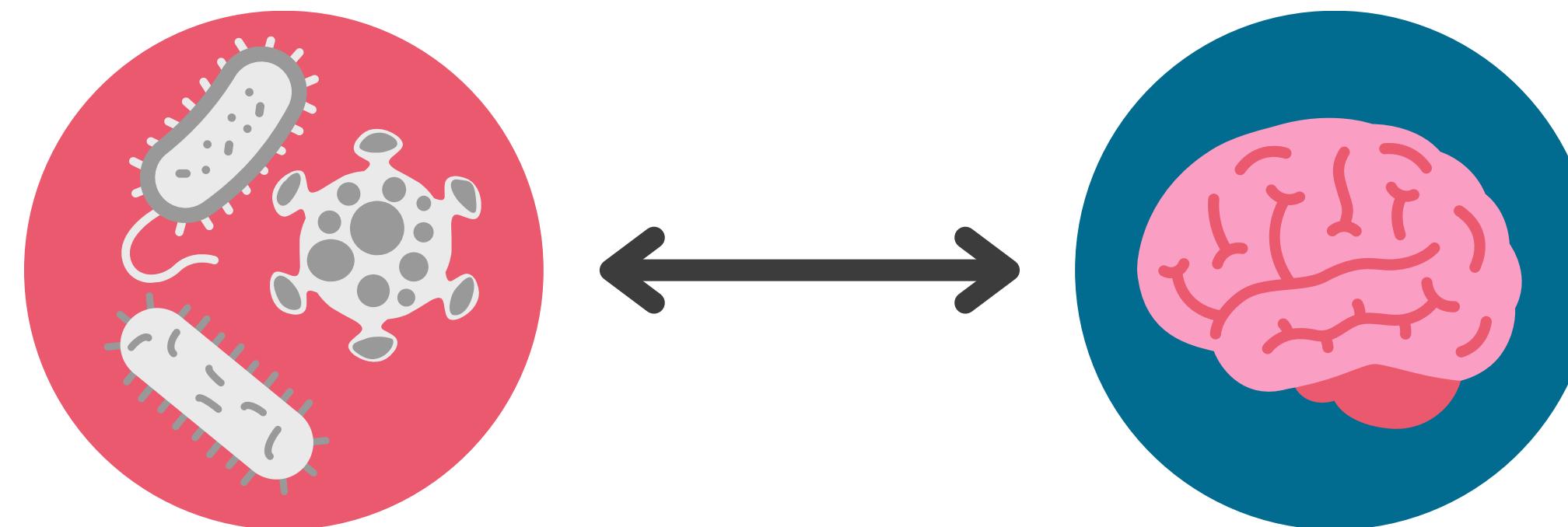


Especially following
interpersonal
adversity



Lack of effective, well-
tolerated treatments

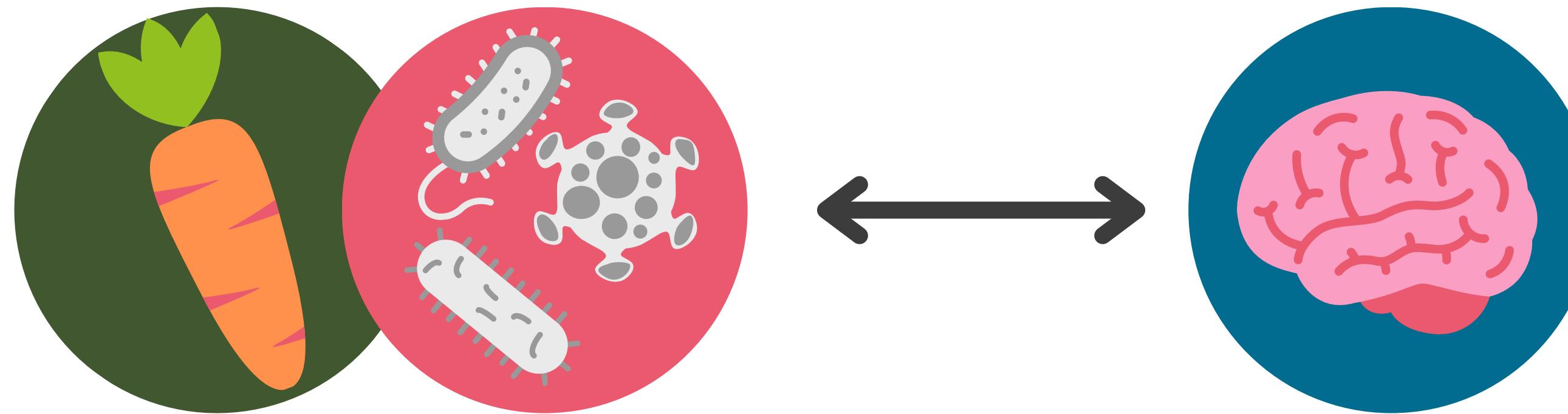
Can we leverage the **gut-microbiome-brain** axis?



Cryan & Dinan, 2012; Callaghan et al., 2020

Can we leverage the **gut-microbiome-brain** axis?

Focus: Diet



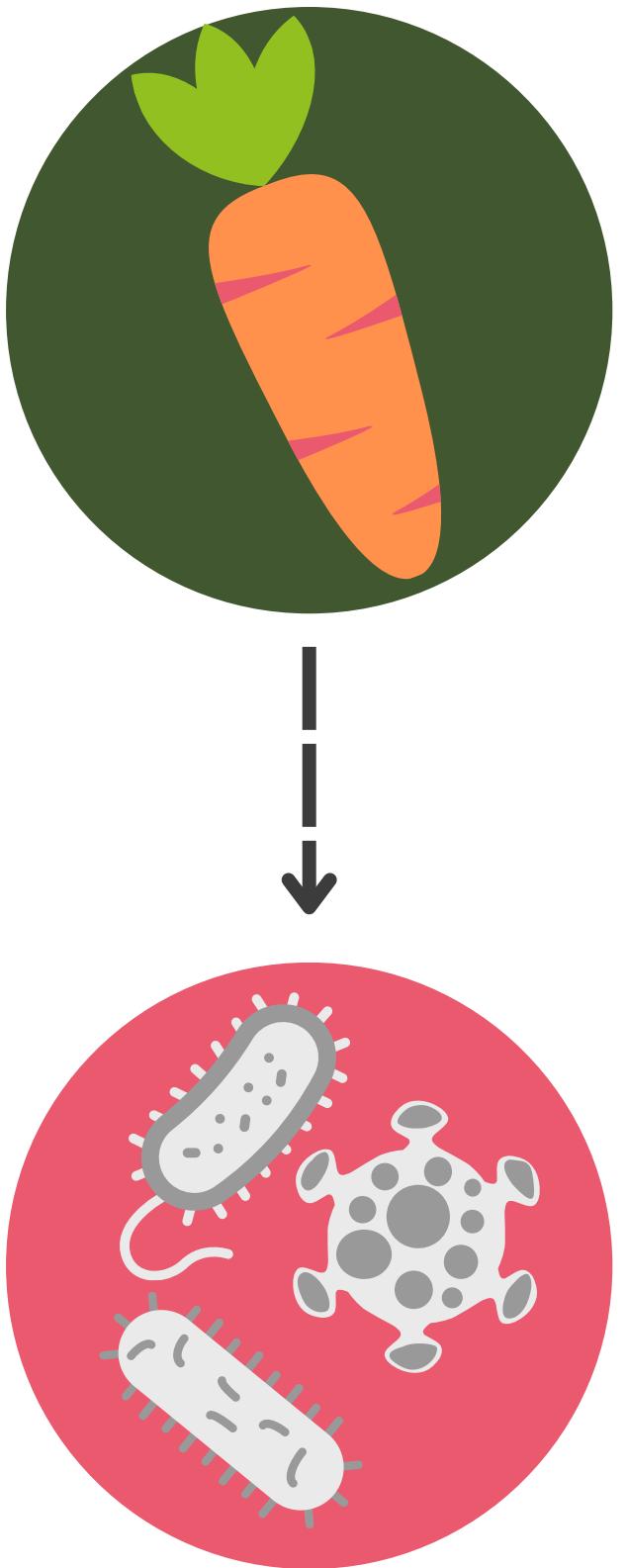
Cryan & Dinan, 2012; Callaghan et al., 2020

Fiber

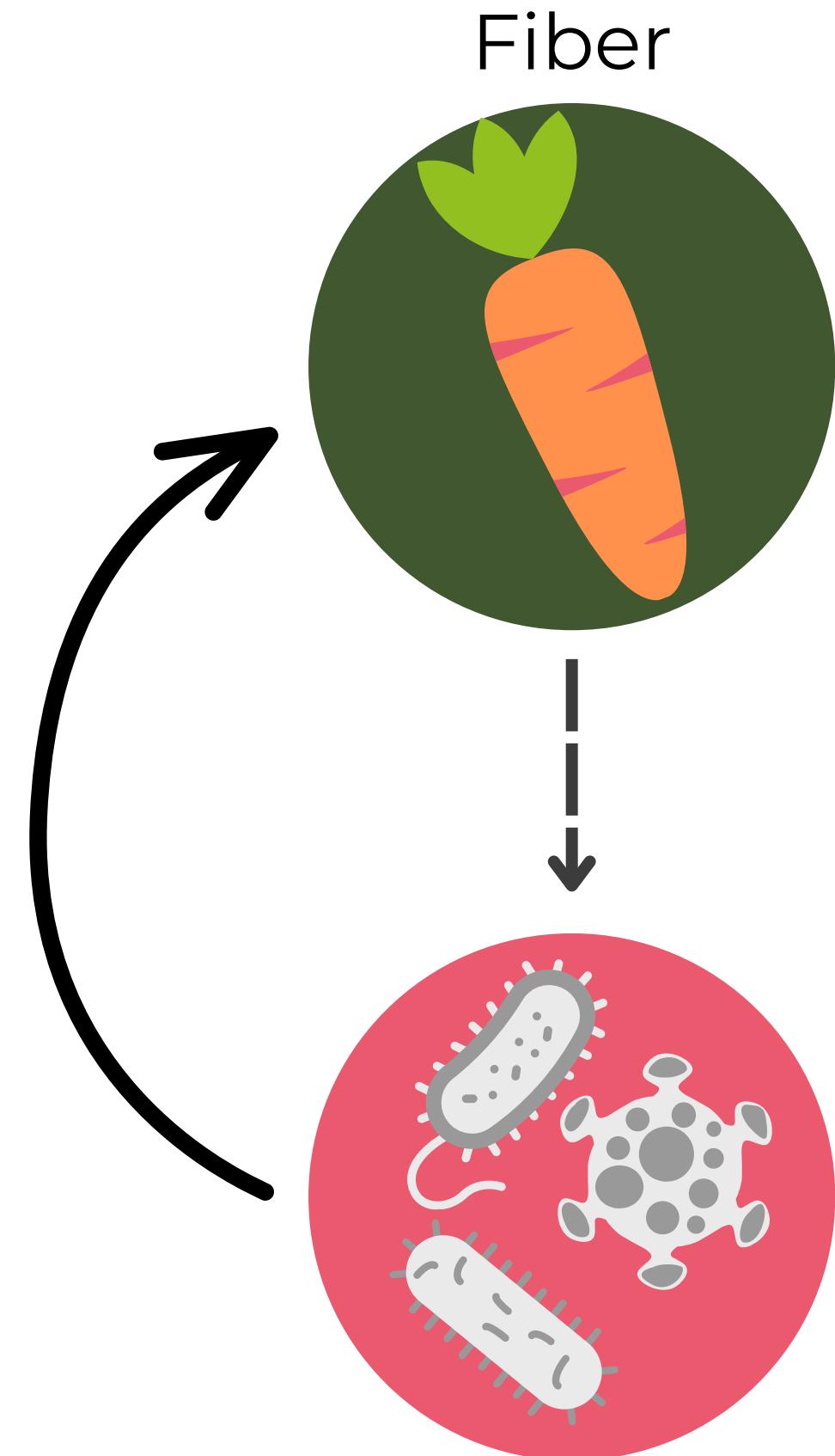


Baxter et al., 2019; Morrison et al., 2020; van de Wouw et al., 2018; De Marco et al., 2021; Noble et al., 2017

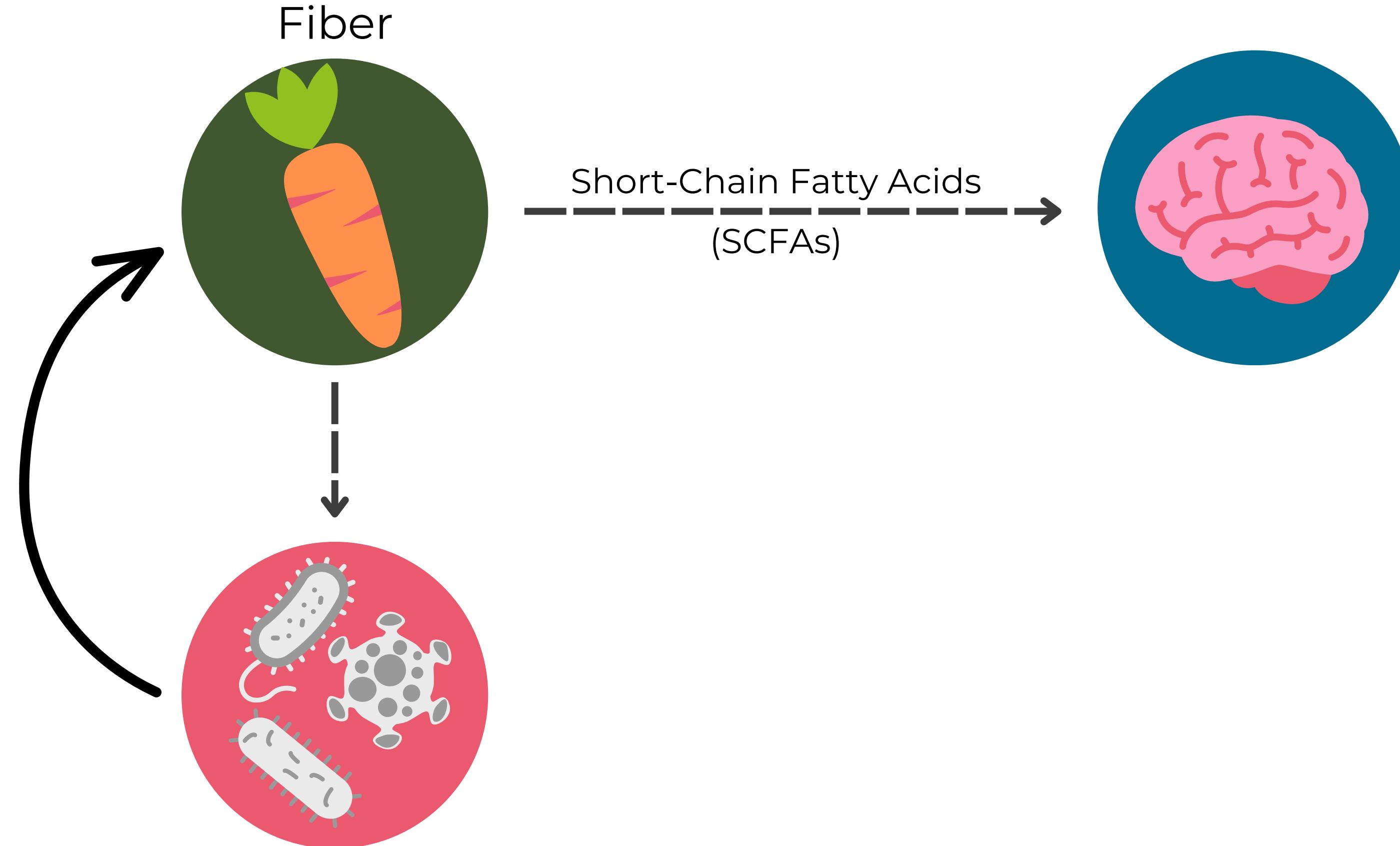
Fiber



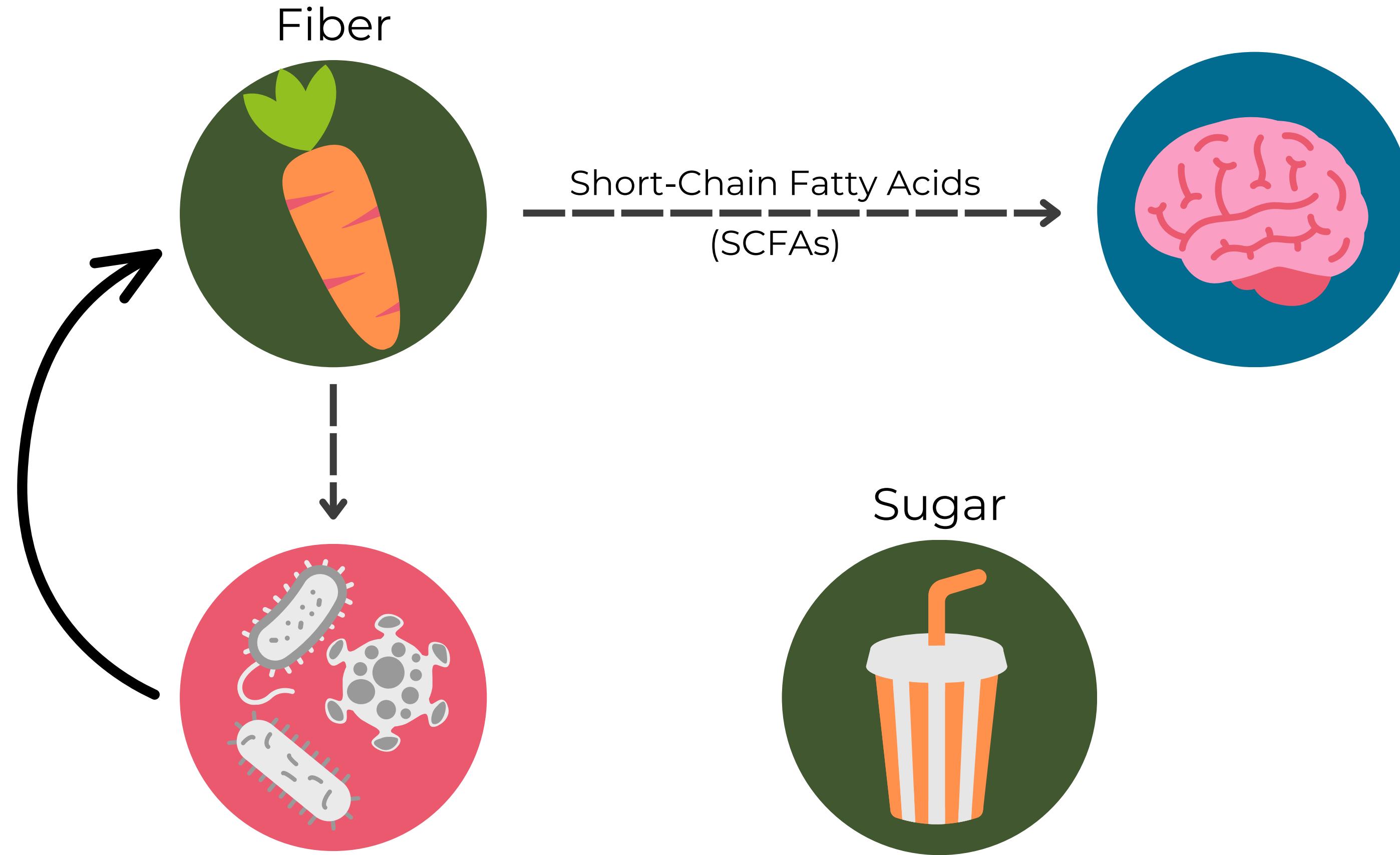
Baxter et al., 2019; Morrison et al., 2020; van de Wouw et al., 2018; De Marco et al., 2021; Noble et al., 2017



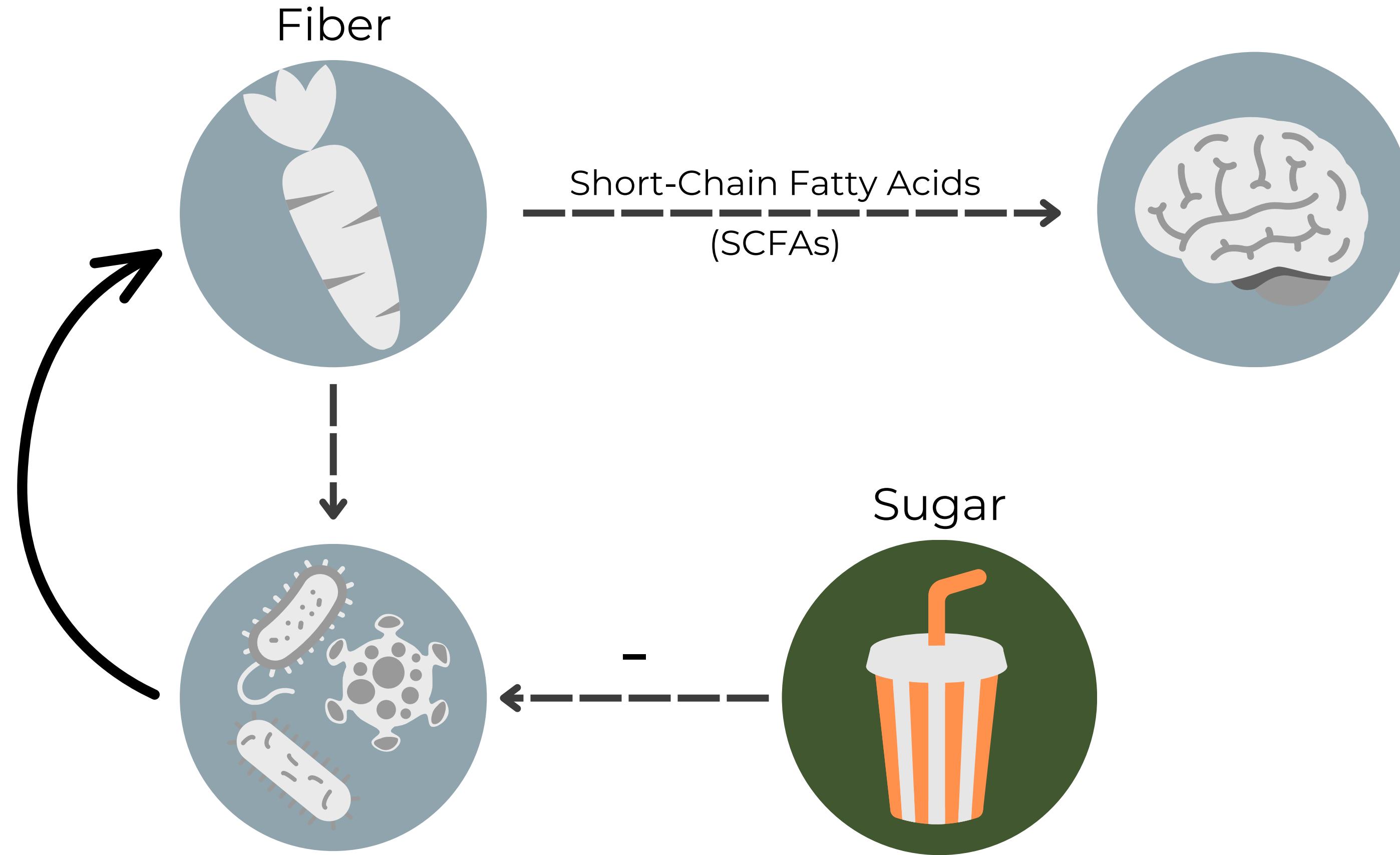
Baxter et al., 2019; Morrison et al., 2020; van de Wouw et al., 2018; De Marco et al., 2021; Noble et al., 2017



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Baxter et al., 2019; Morrison et al., 2020; van de Wouw et al., 2018; De Marco et al., 2021; Noble et al., 2017



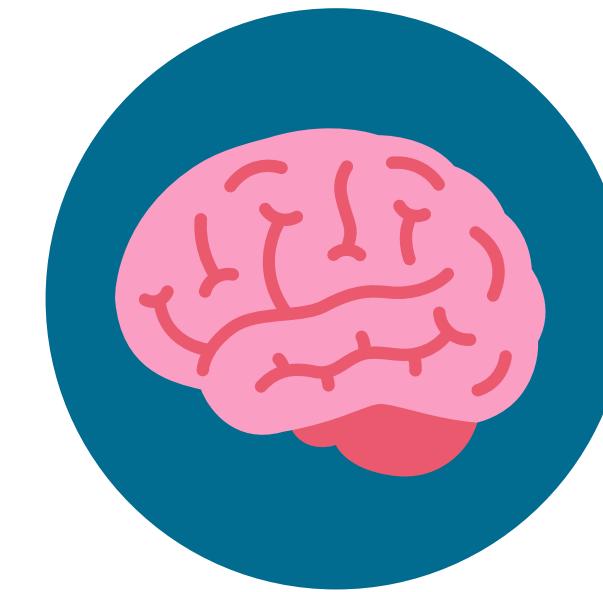
Baxter et al., 2019; Morrison et al., 2020; van de Wouw et al., 2018; De Marco et al., 2021; Noble et al., 2017



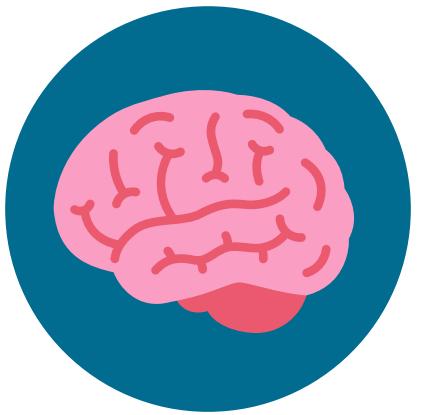
Self-Reported Symptoms



Self-Reported
Symptoms

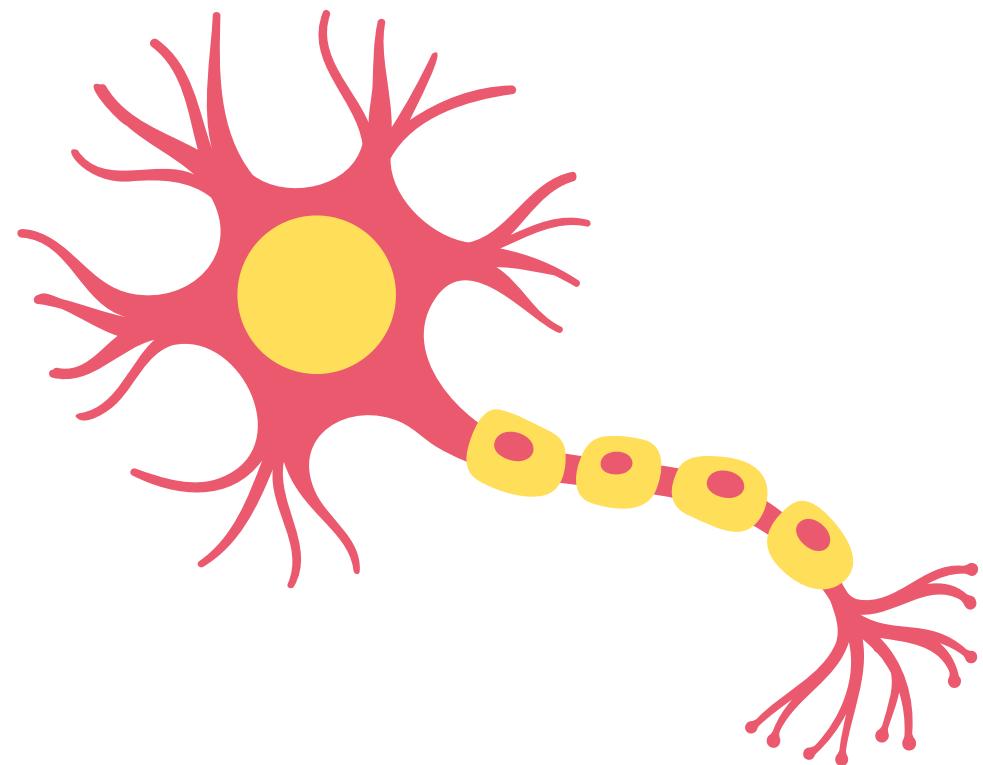


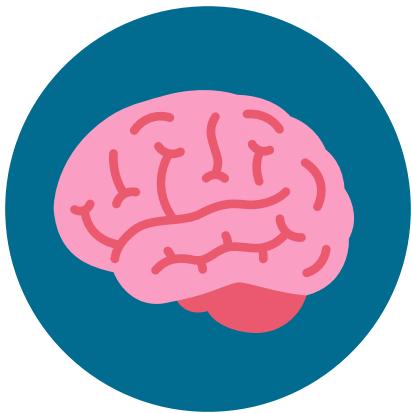
Basal Ganglia
Tissue Iron



Basal Ganglia
Tissue Iron

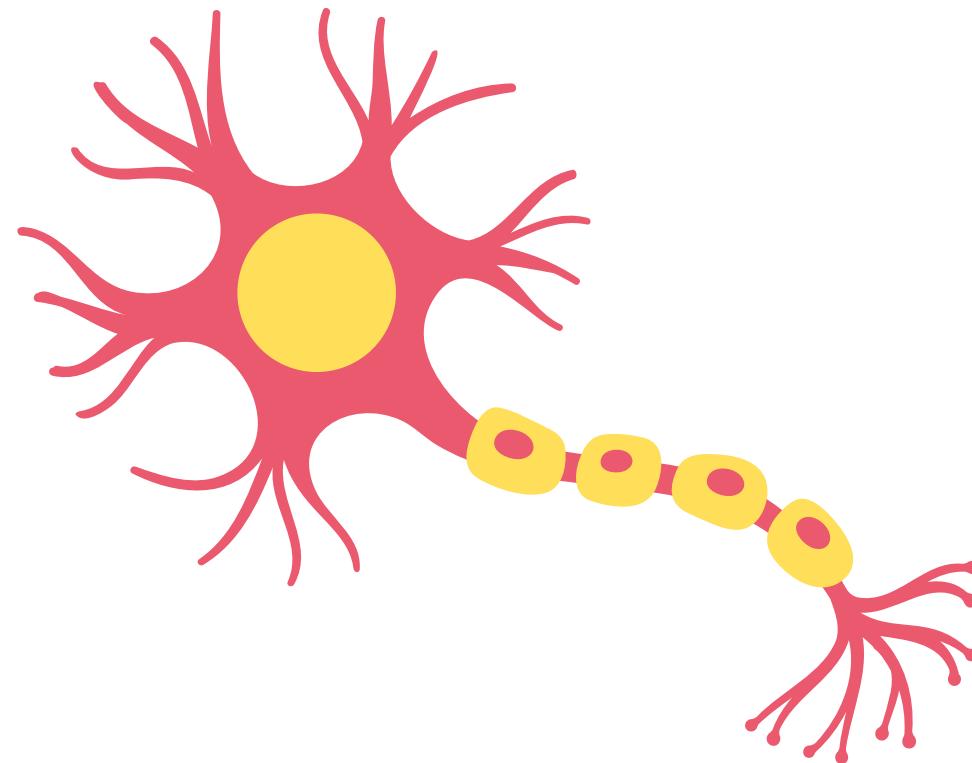
Accumulates via processes
such as dopamine synthesis





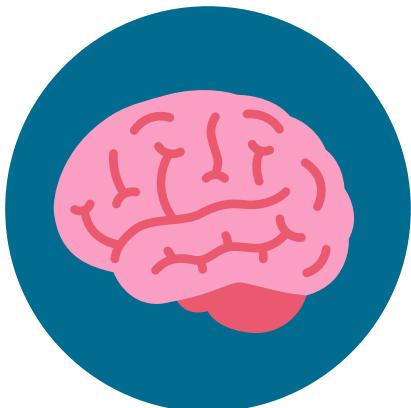
Basal Ganglia
Tissue Iron

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such as dopamine synthesis



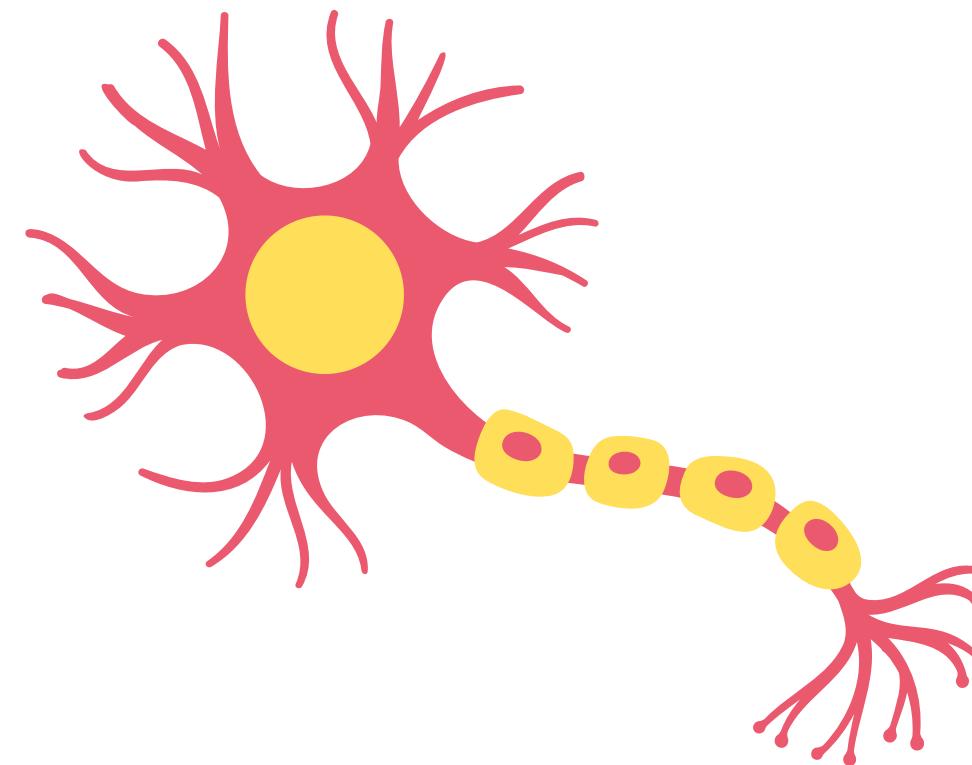
Associated w/functional
reward circuits and behavior





Basal Ganglia
Tissue Iron

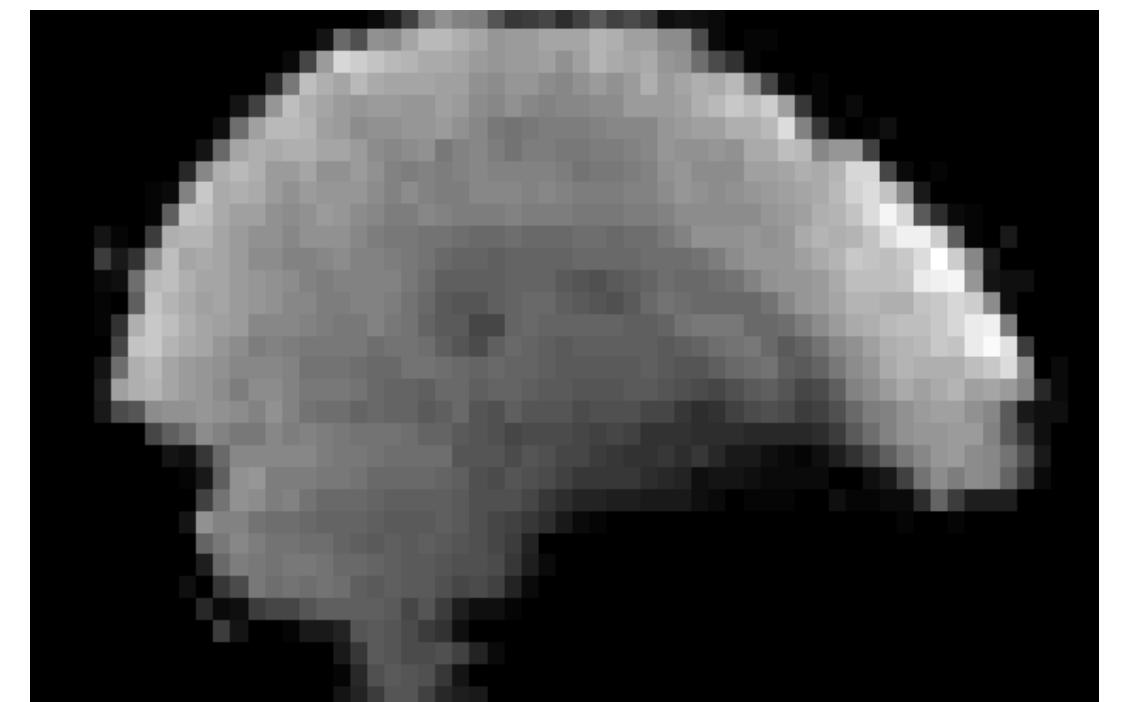
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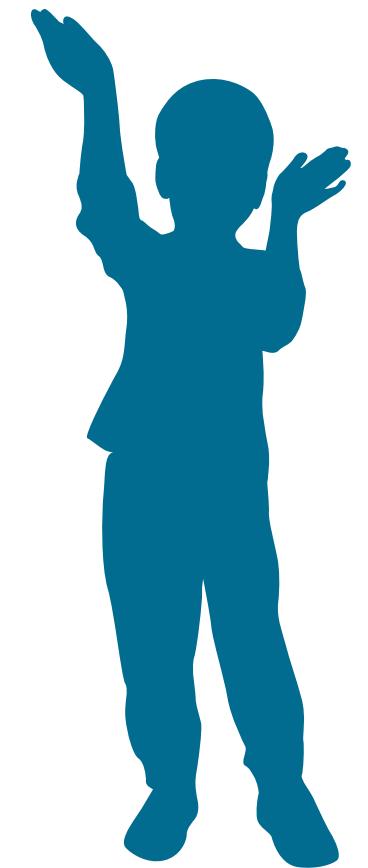


Associated w/functional
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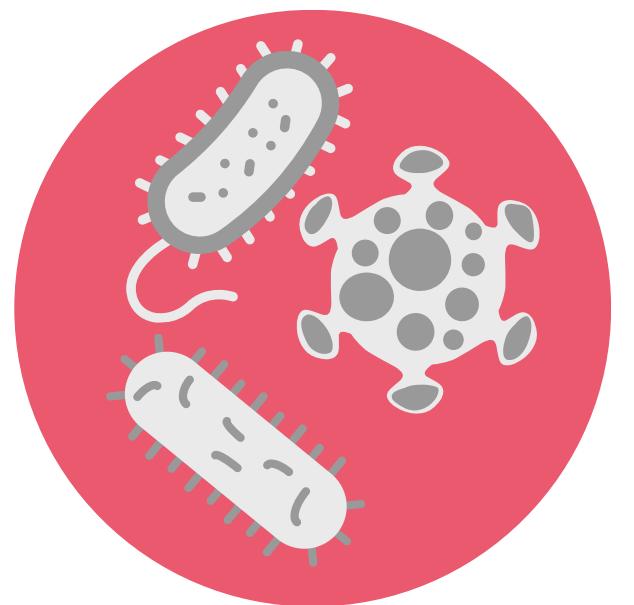
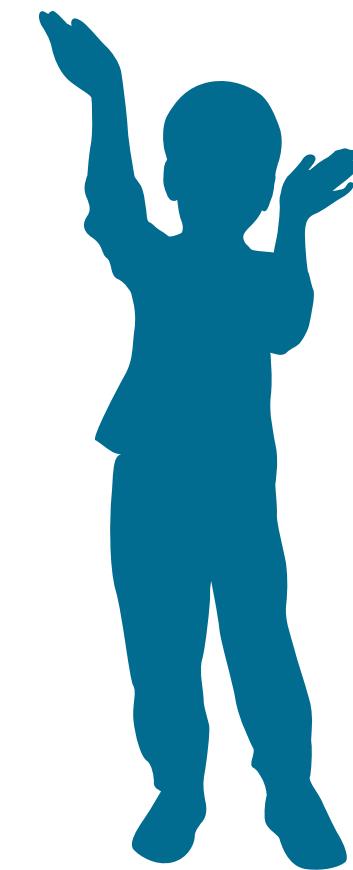


Estimated using time-averaged
& normalized T2*w image

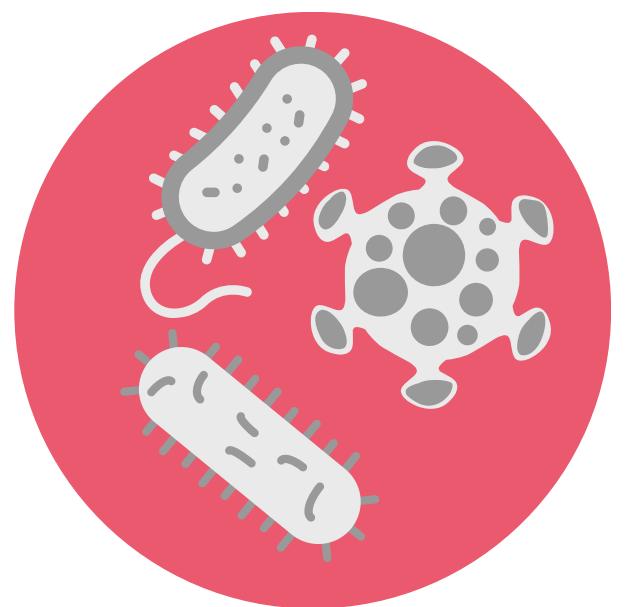
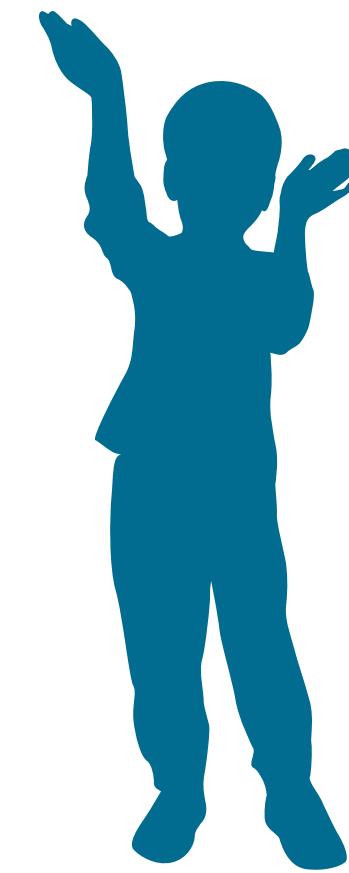




102 Children
Age 1-17



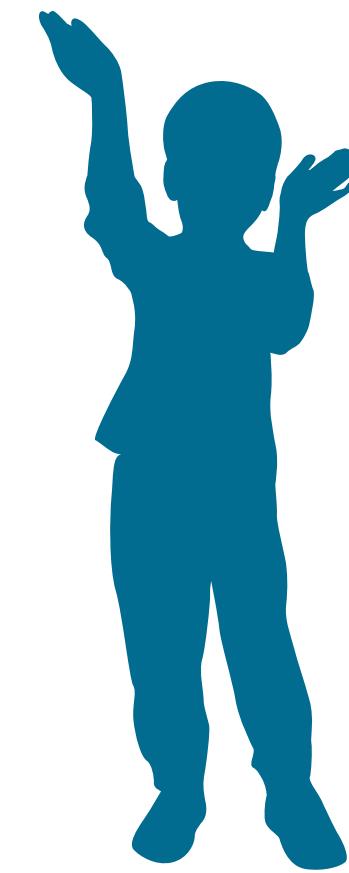
102 Children Microbiome
Age 1-17



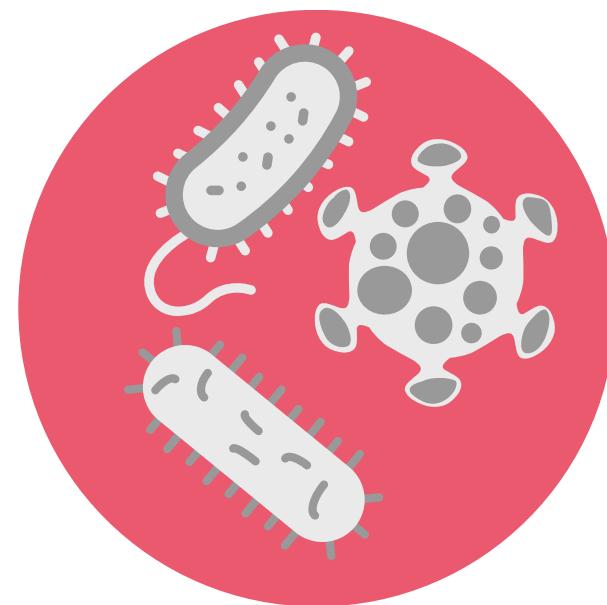
102 Children
Age 1-17

Microbiome

Diet



102 Children
Age 1-17



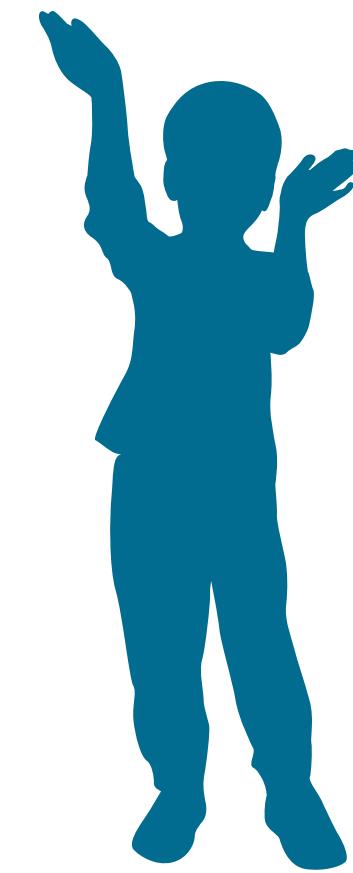
Microbiome



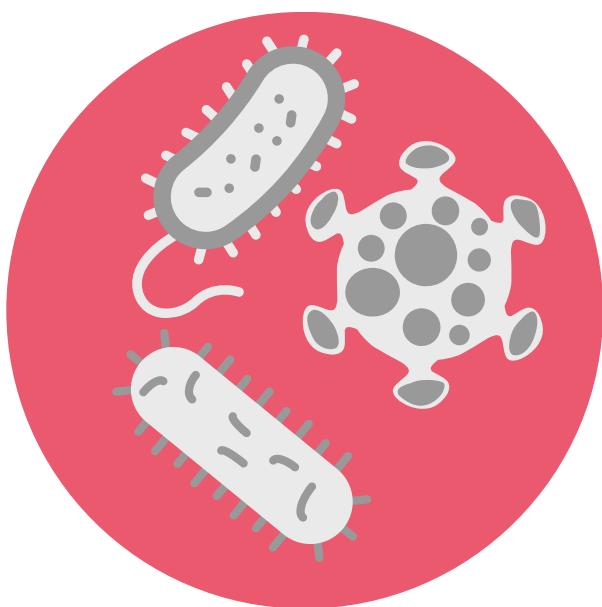
Diet



Internalizing
Sx



102 Children
Age 1-17



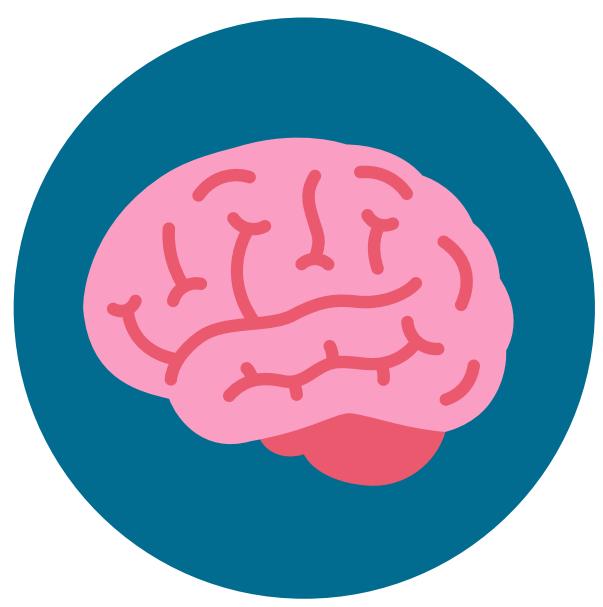
Microbiome



Diet



Internalizing
Sx



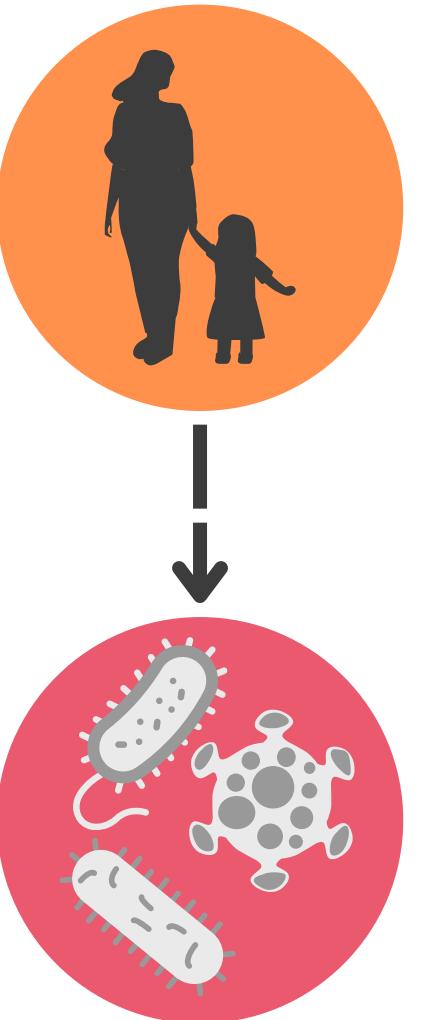
fMRI
(N = 48)

N = 49



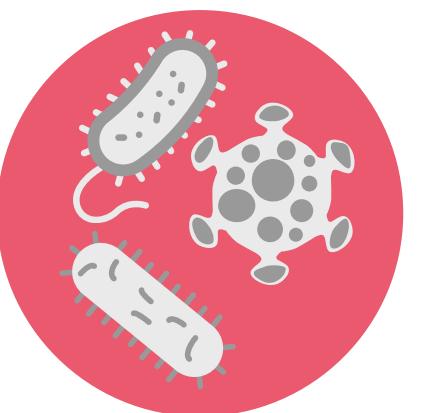
Interpersonal adversity
(Prior but not ongoing)

Aims

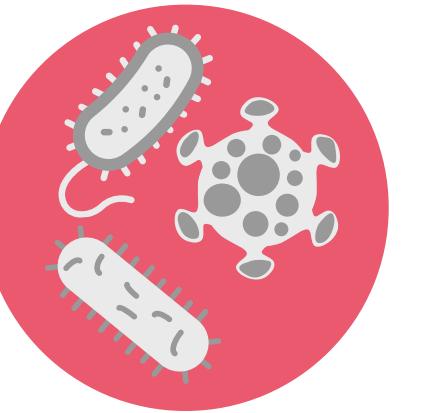


Adversity &
Microbiome

Aims

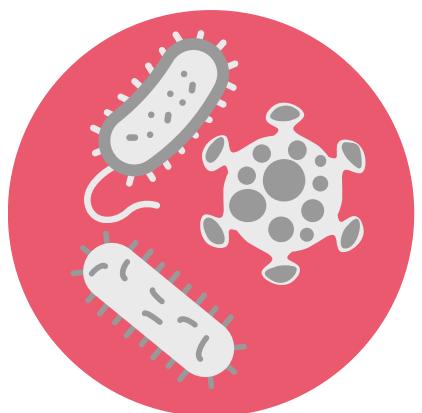


Adversity &
Microbiome

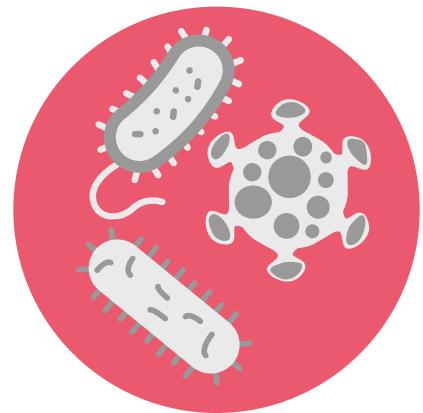


Microbiome &
Internalizing Sx

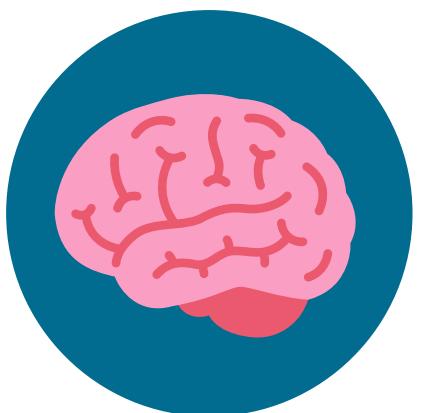
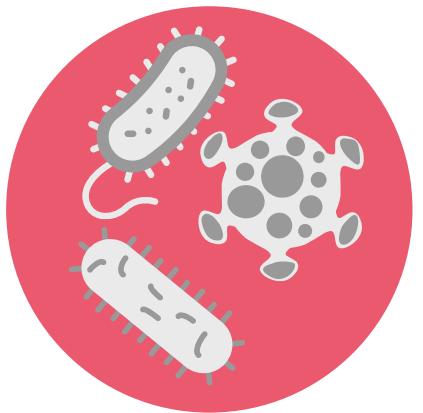
Aims



Adversity &
Microbiome

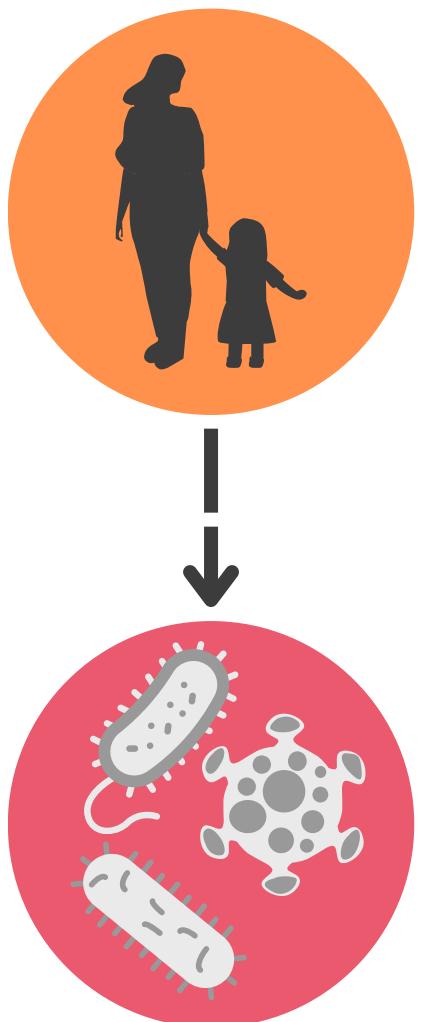


Microbiome &
Internalizing Sx

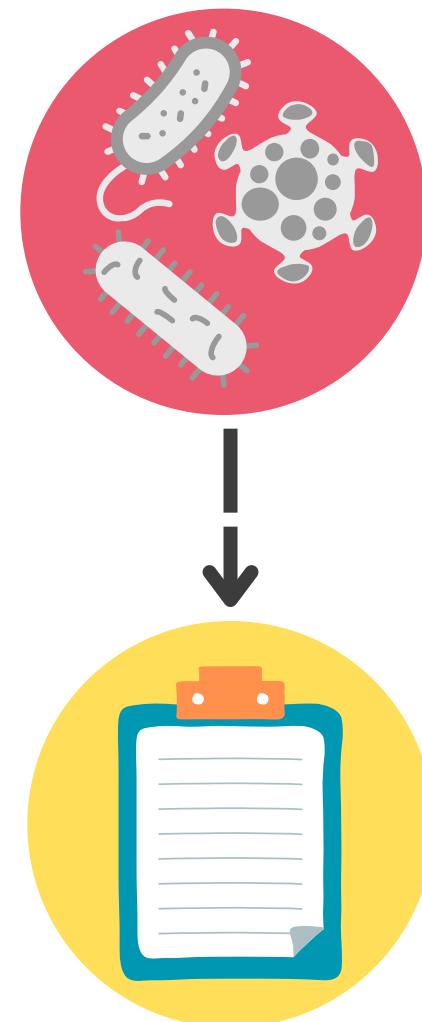


Microbiome &
Tissue Iron

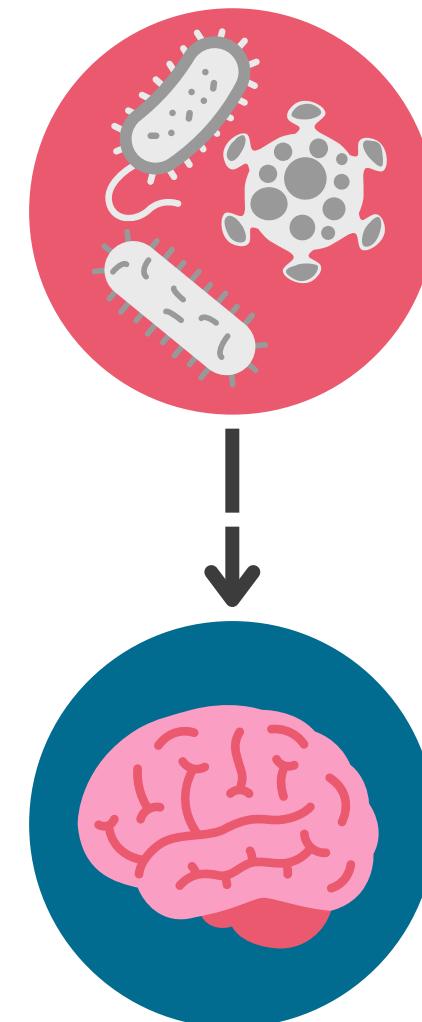
Aims



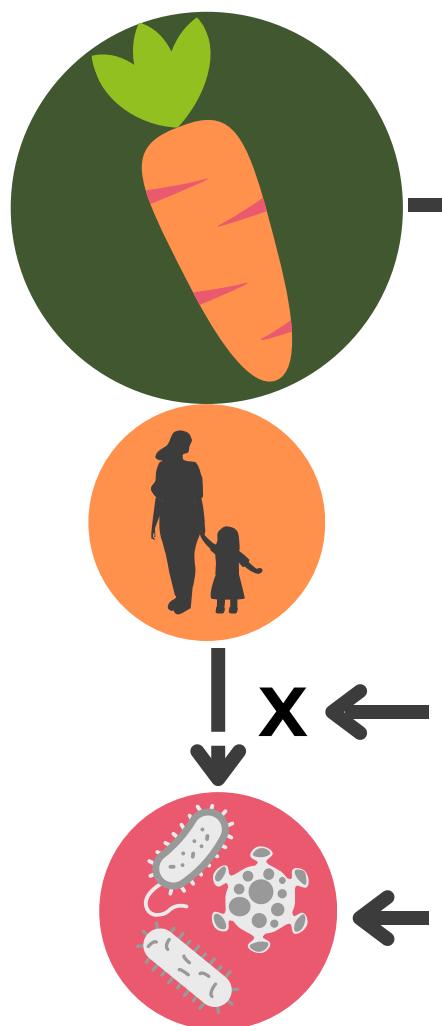
Adversity &
Microbiome



Microbiome &
Internalizing Sx



Microbiome &
Tissue Iron



Diet as
Mitigator

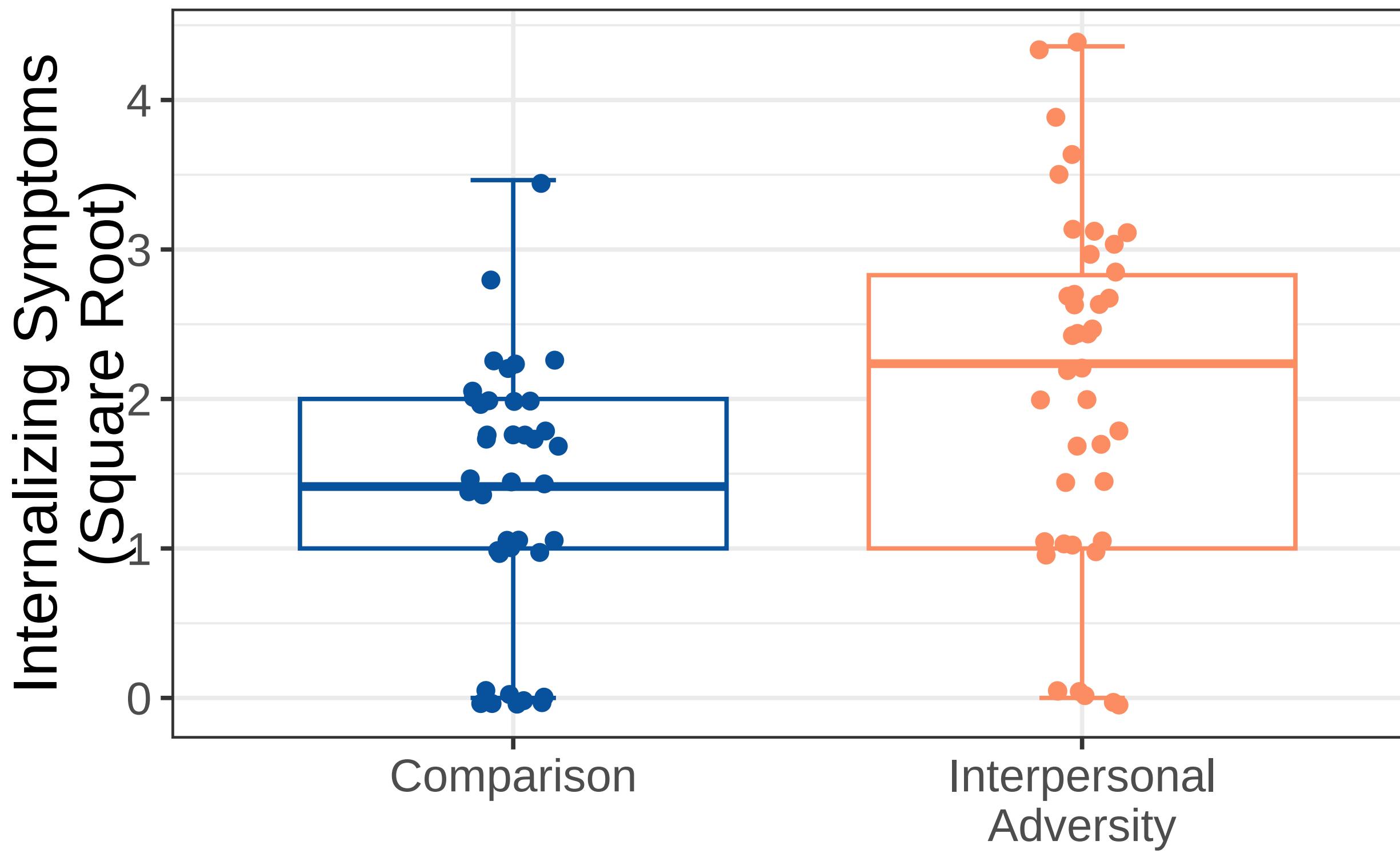
Interpersonal Adversity**Comparison**

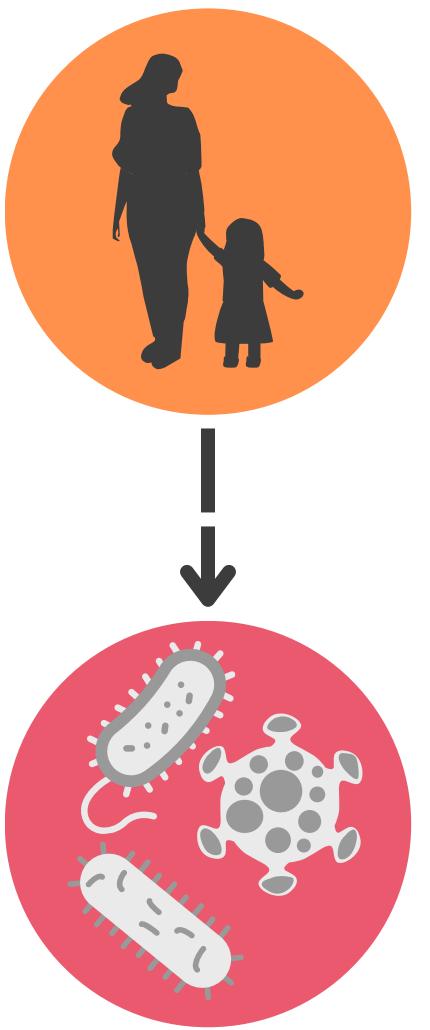
Age	9.89 (4.96)	7.07 (4.64)	*
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	Interpersonal Adversity	Comparison	
Age	9.89 (4.96)	7.07 (4.64)	*
Female	30 (61.22%)	24 (45.28%)	
Male	19 (38.78%)	29 (54.72%)	

	Interpersonal Adversity	Comparison	
Age	9.89 (4.96)	7.07 (4.64)	*
Female	30 (61.22%)	24 (45.28%)	
Male	19 (38.78%)	29 (54.72%)	
<hr/>			
Asian American	19 (38.78%)	2 (3.77%)	
White	10 (20.41%)	16 (30.19%)	*
Other	7 (14.29%)	8 (15.09%)	
<hr/>			

	Interpersonal Adversity	Comparison	
Age	9.89 (4.96)	7.07 (4.64)	*
Female	30 (61.22%)	24 (45.28%)	
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<hr/>			
Asian American	19 (38.78%)	2 (3.77%)	
White	10 (20.41%)	16 (30.19%)	*
Other	7 (14.29%)	8 (15.09%)	
<hr/>			
Caregiver Education - Bachelor's Degree	11 (22.45%)	12 (22.64%)	





Adversity &
Microbiome

Microbiome Primer

Alpha Diversity



Microbiome Primer

Alpha Diversity



Microbiome Primer

Alpha Diversity



Faith's Diversity

Differential Abundance

Microbiome Primer

Alpha Diversity



Faith's Diversity

Differential Abundance



Feature1 ~ X + Z + W

Microbiome Primer

Alpha Diversity



Faith's Diversity

Differential Abundance

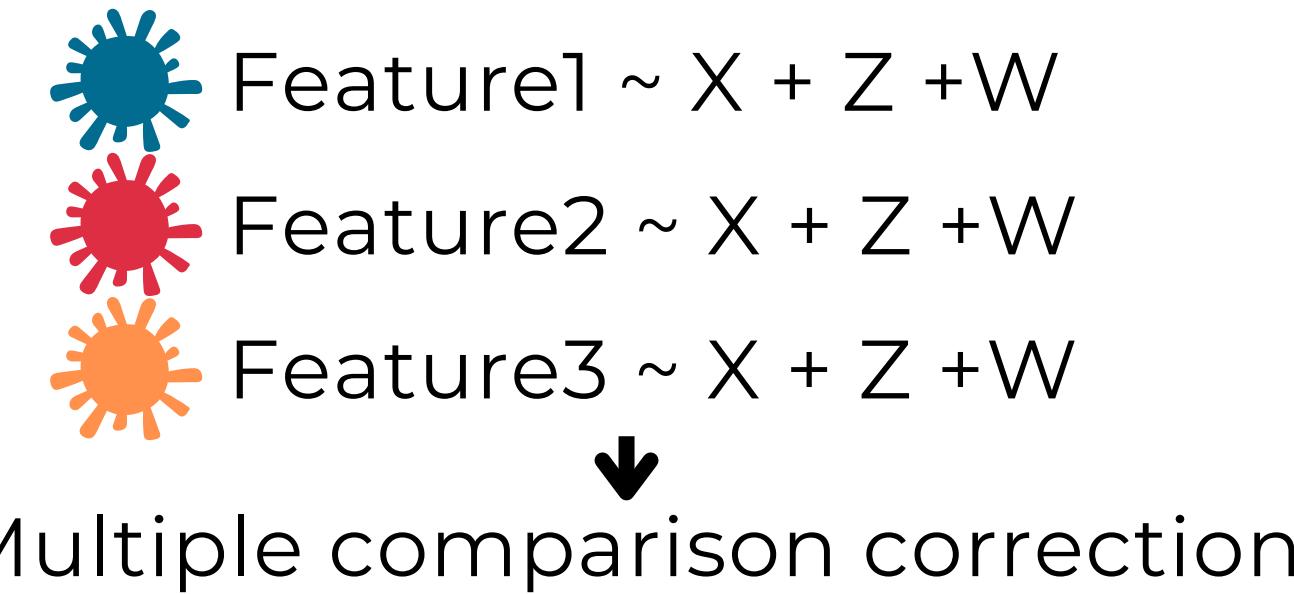
-  Feature1 ~ X + Z + W
-  Feature2 ~ X + Z + W
-  Feature3 ~ X + Z + W

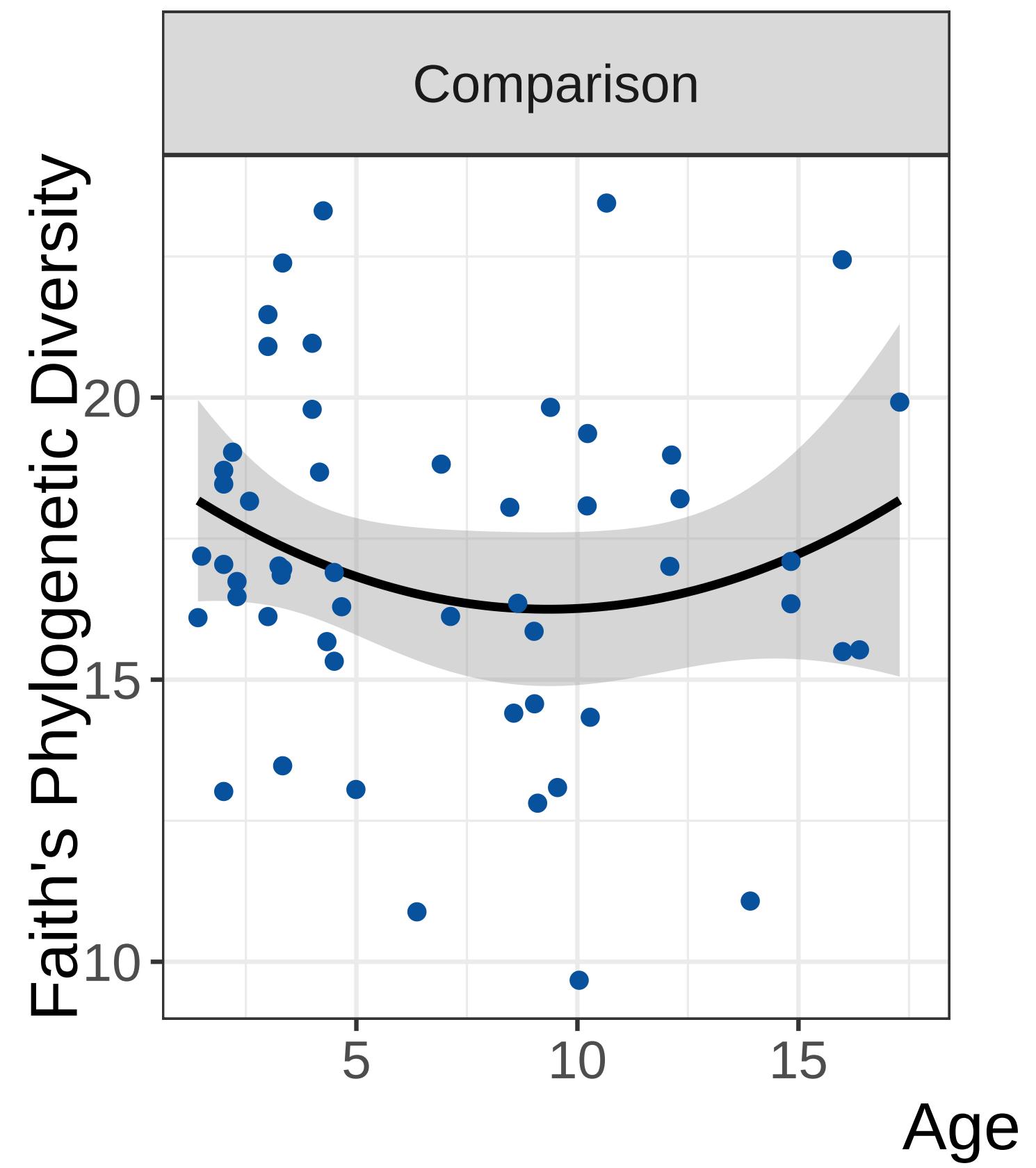
Microbiome Primer

Alpha Diversity



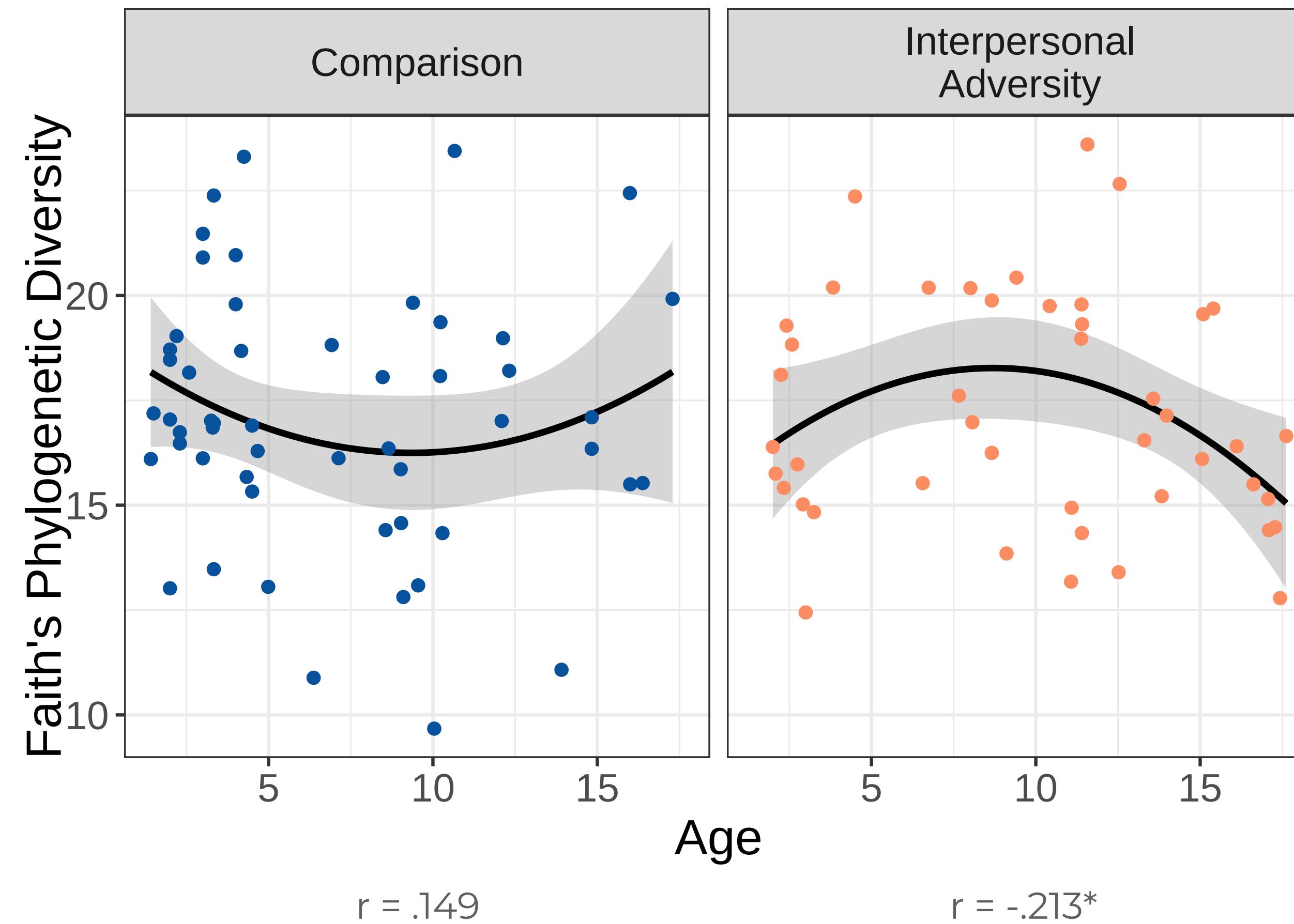
Differential Abundance



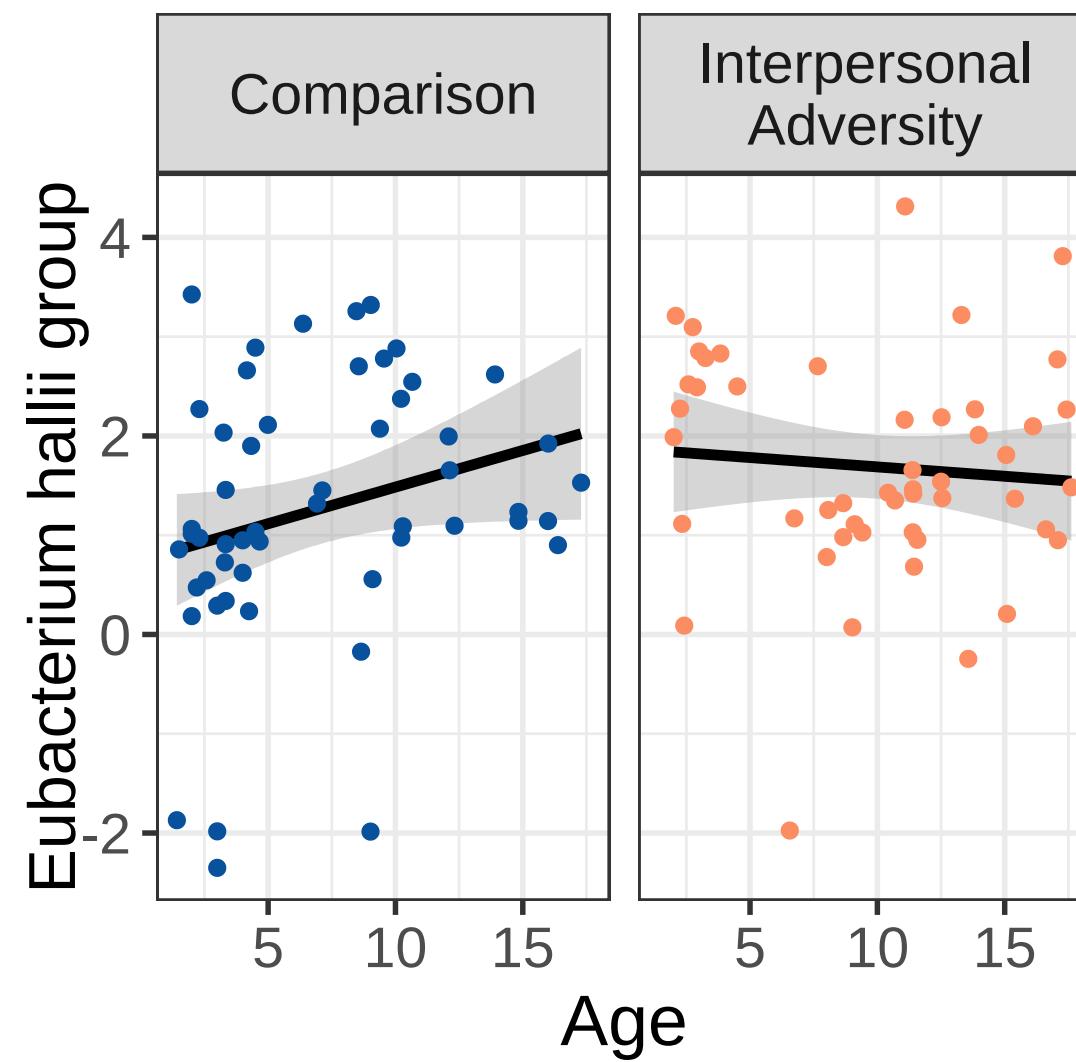


$r = .149$

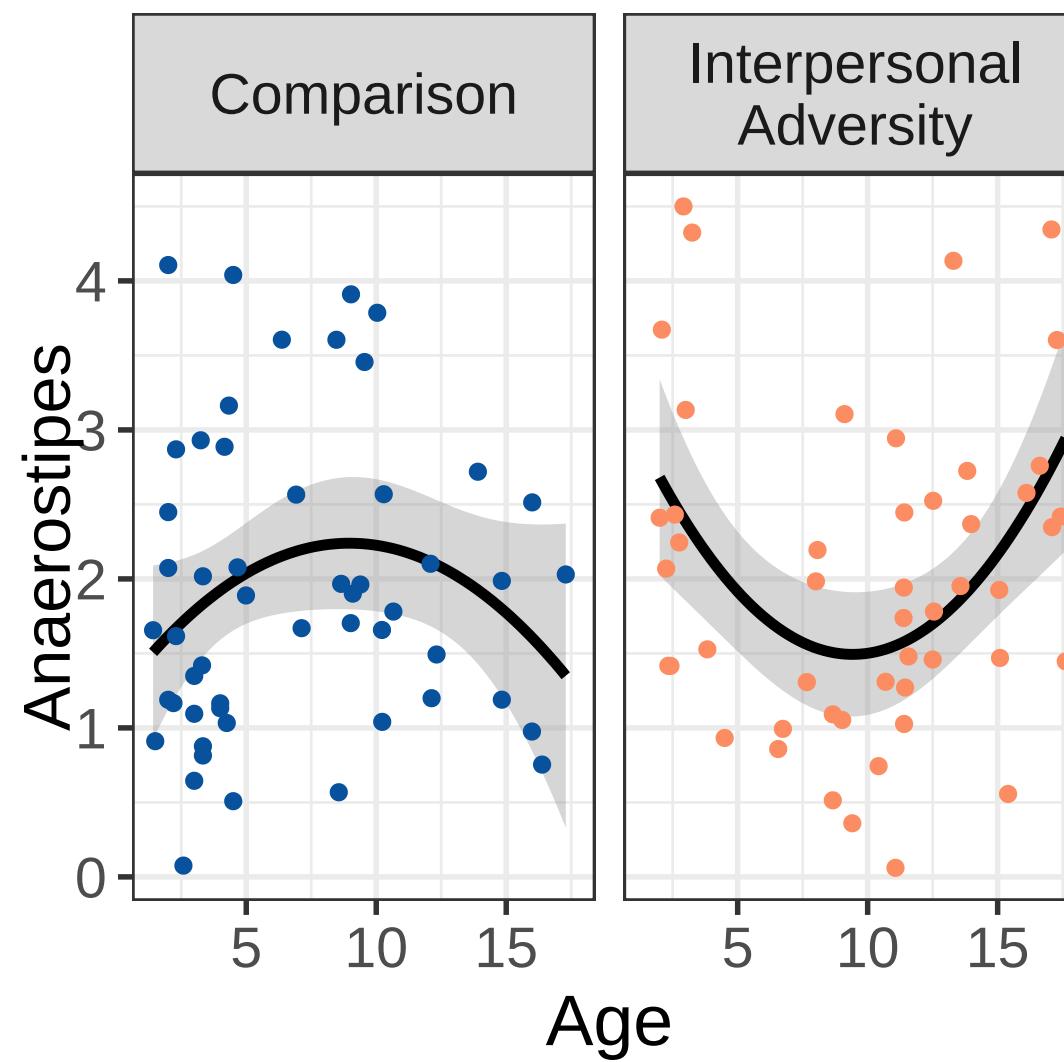
$r = -.213^*$



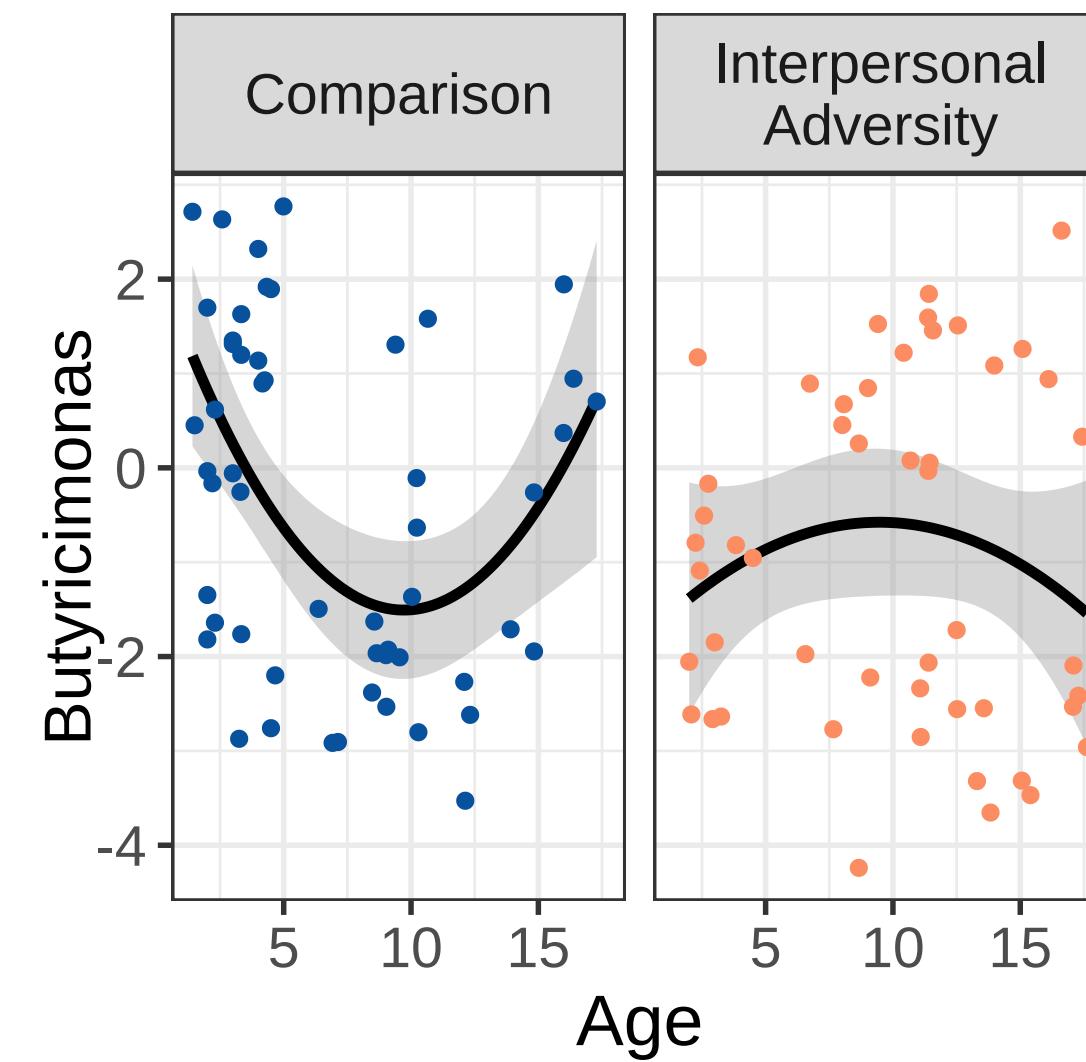
$\text{Age} * \text{IA}$ $r = -0.303^*$



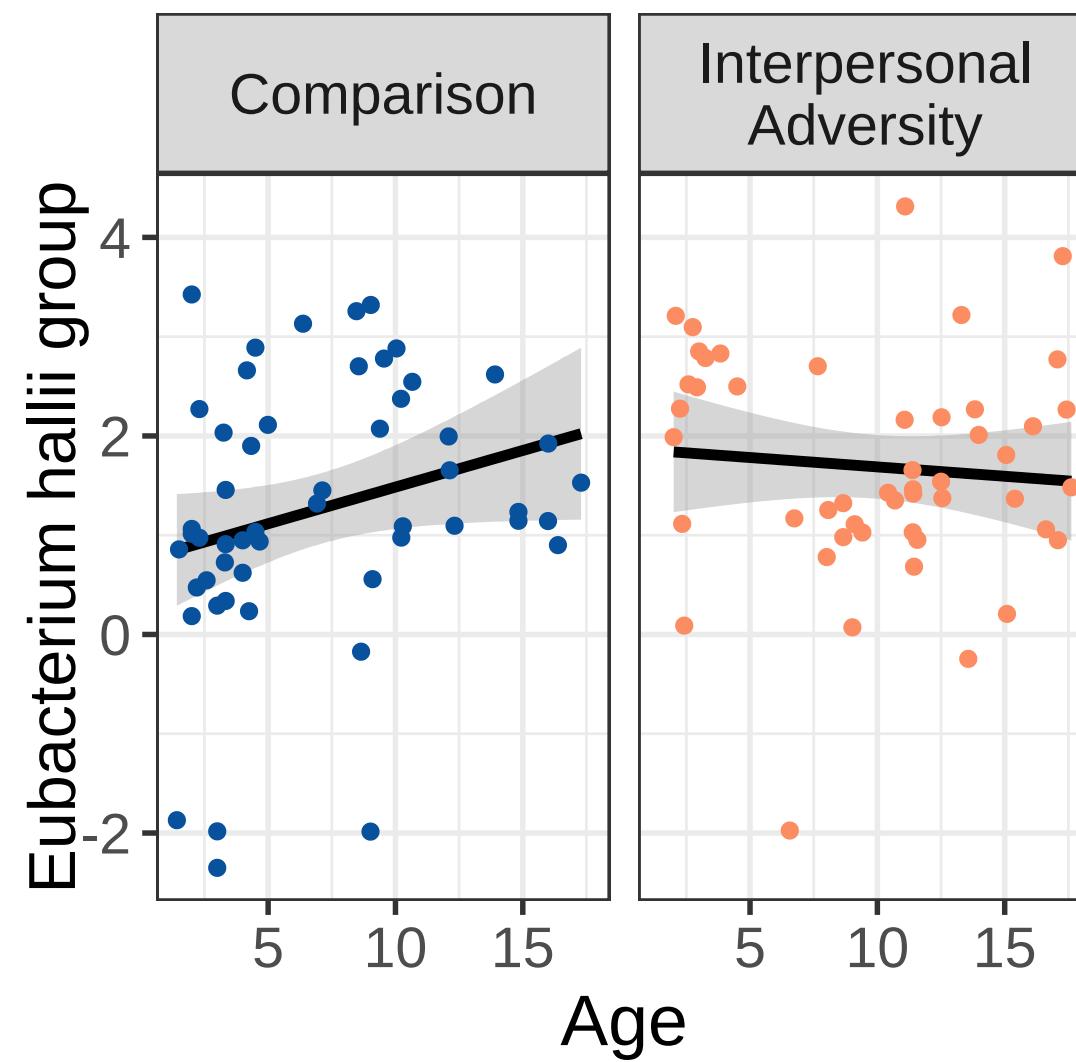
$\text{Age}^2 * \text{IA}$ $r = -0.303^*$



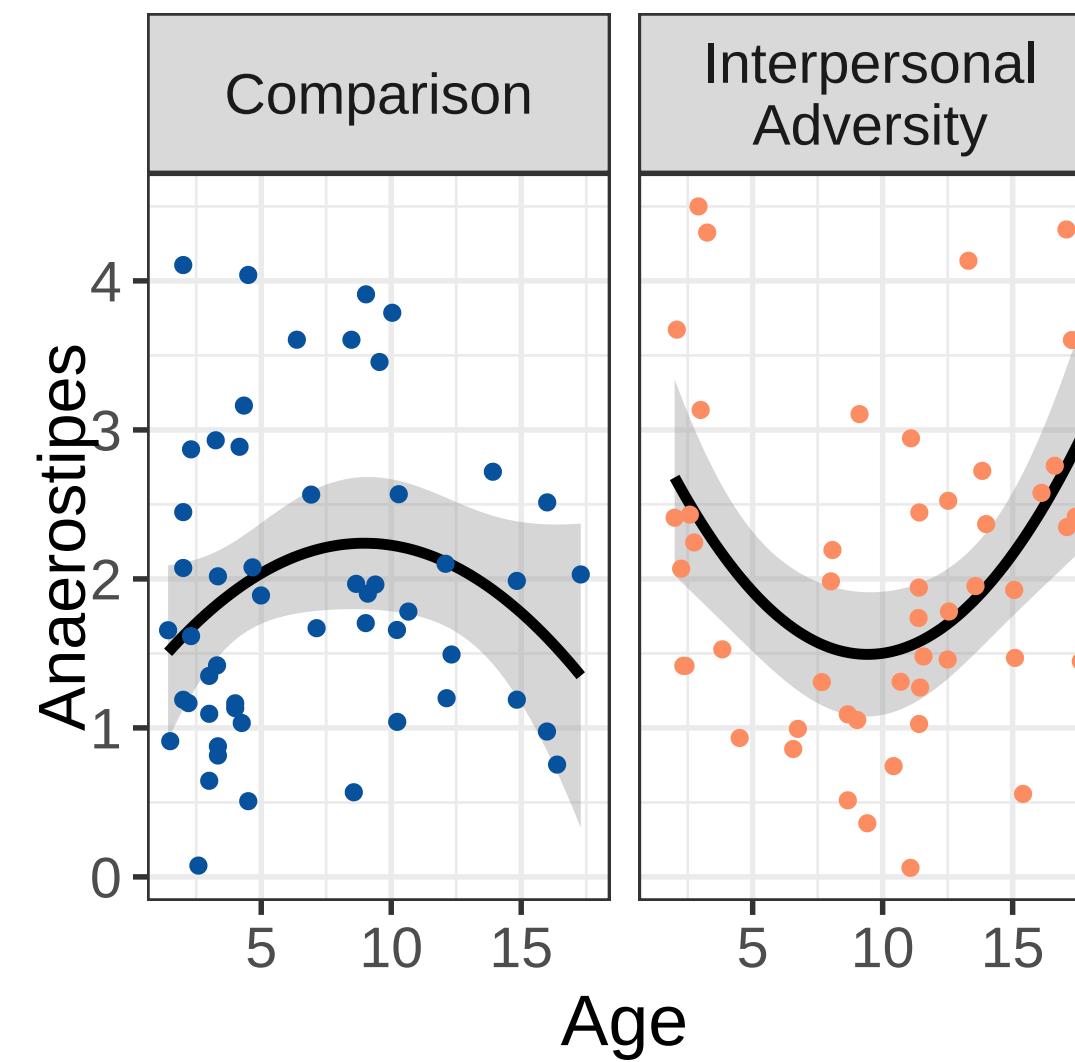
$\text{Age}^2 * \text{IA}$ $r = -0.302^*$



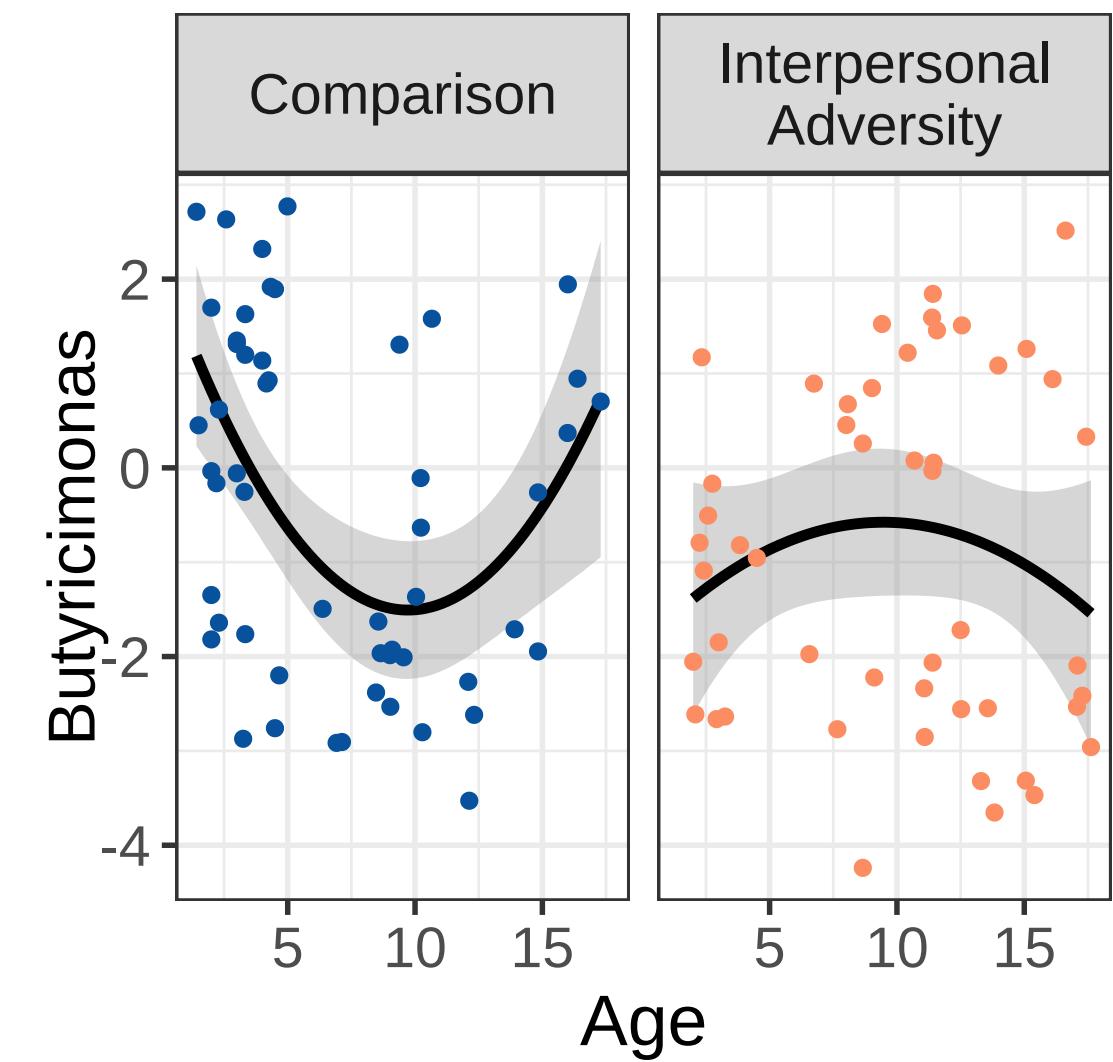
Age * IA $r = -0.303^*$



Age²* IA $r = -0.303^*$

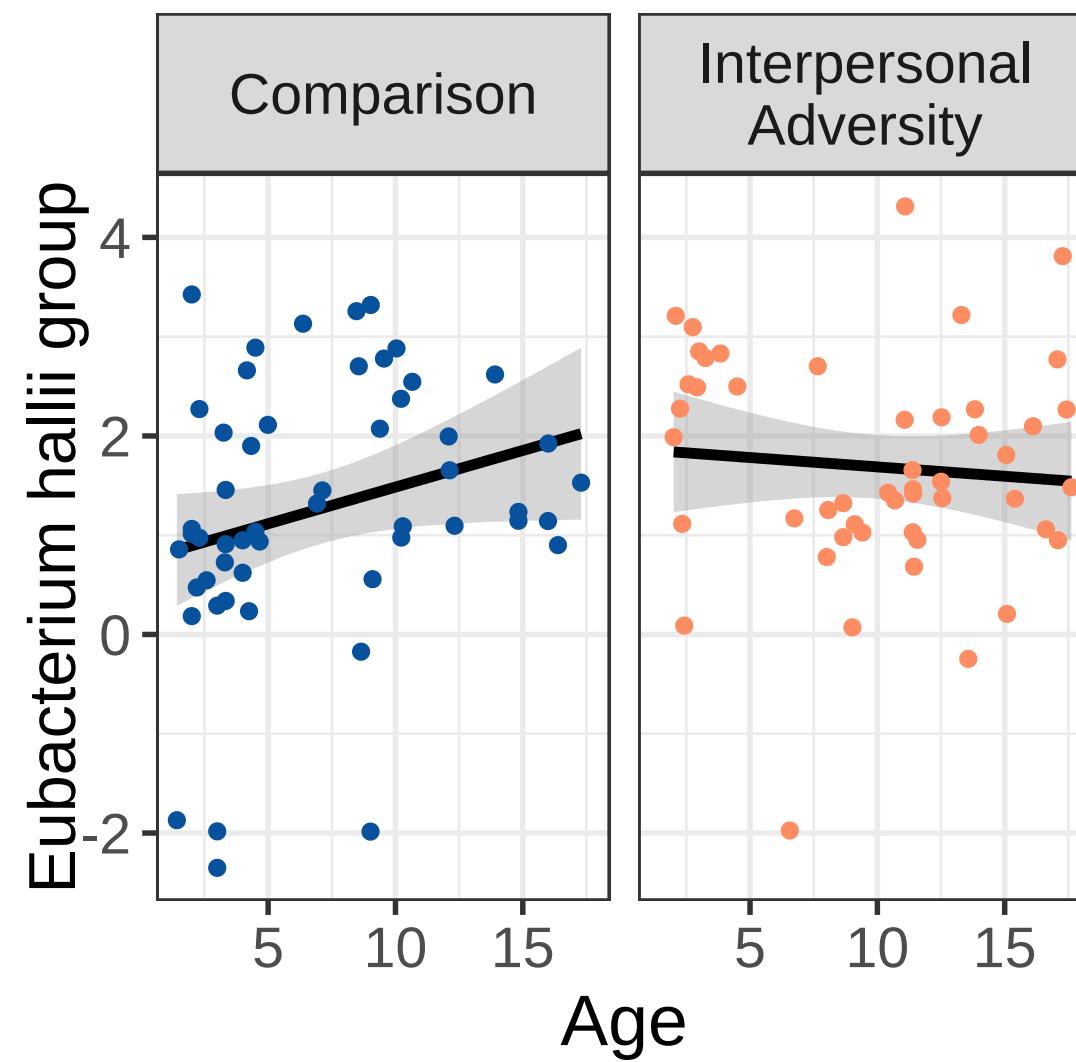


Age²* IA $r = -0.302^*$

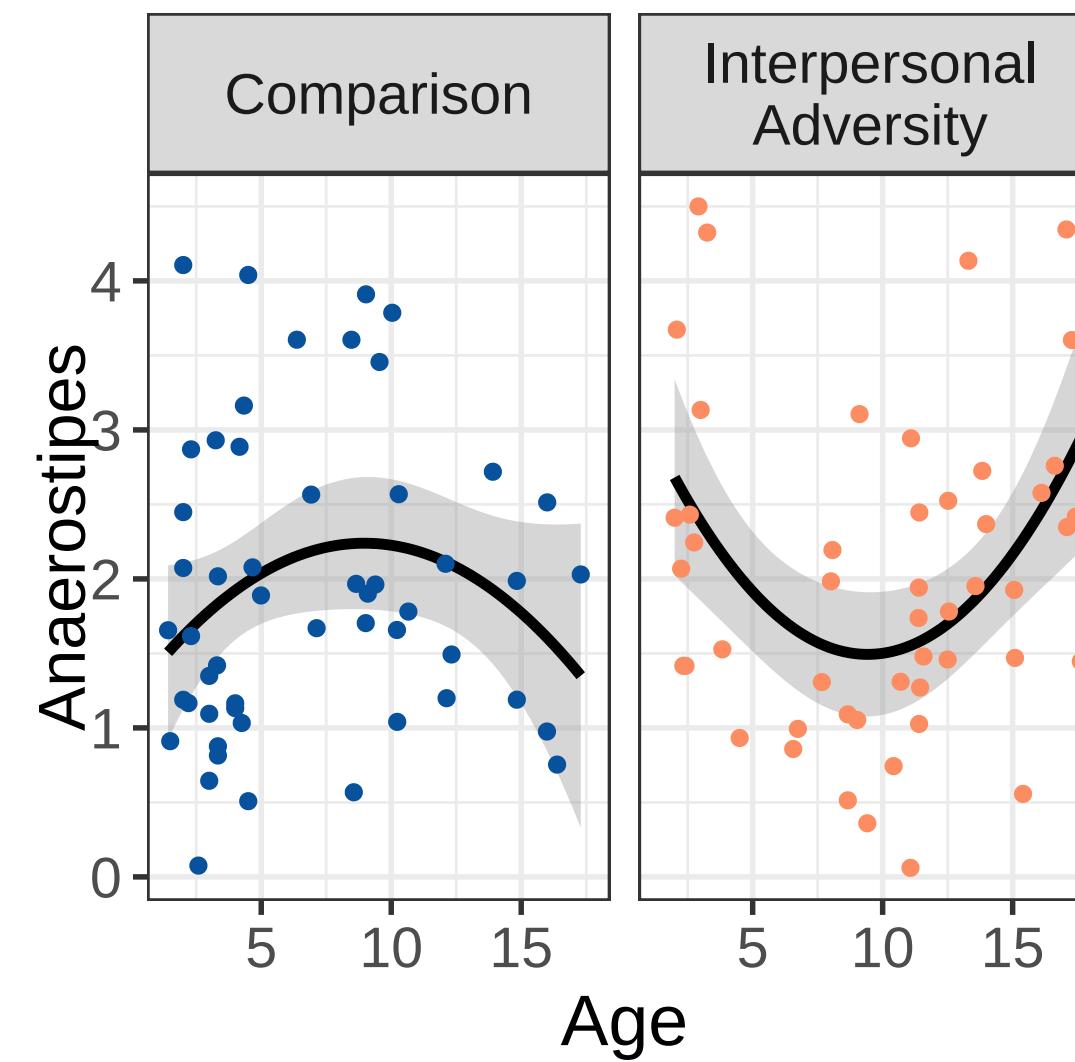


Microbiome remains age-dependent in middle childhood & adolescence

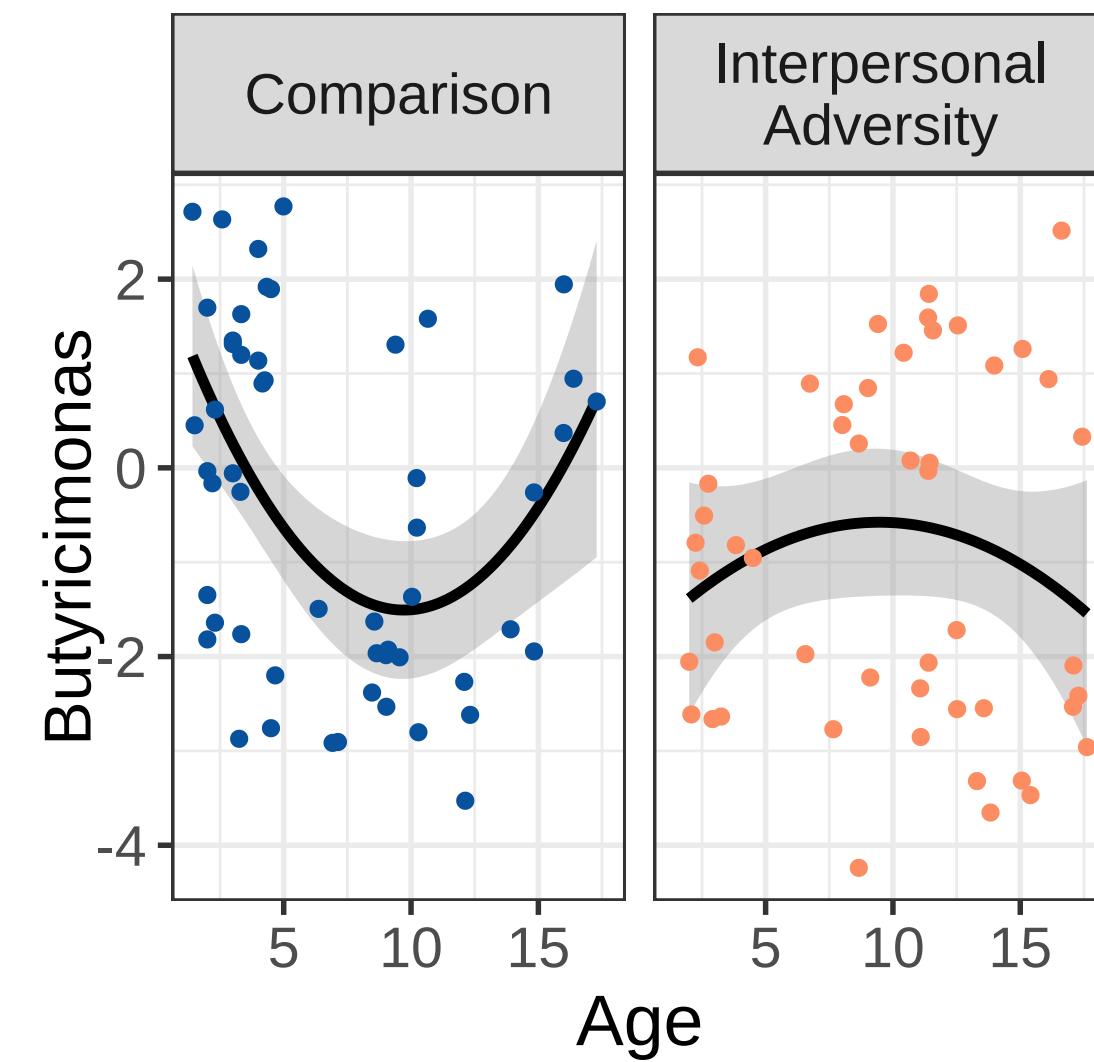
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Age²* IA $r = -0.303^*$

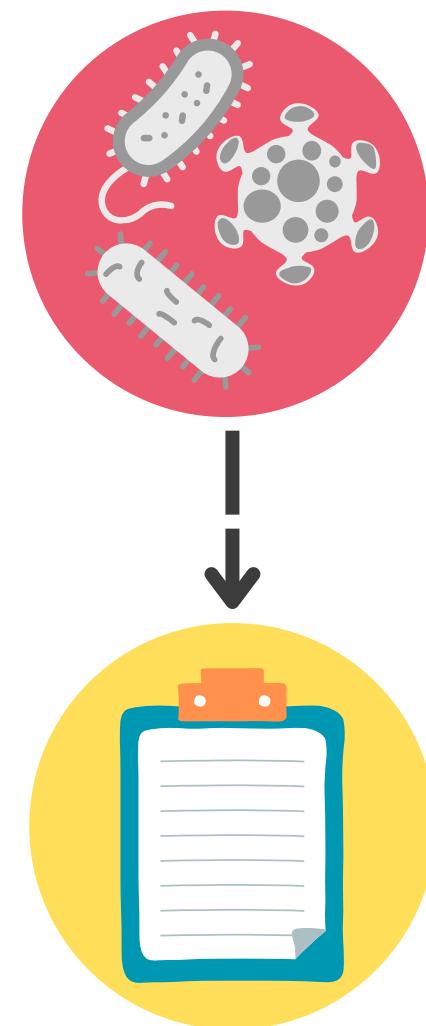


Age²* IA $r = -0.302^*$

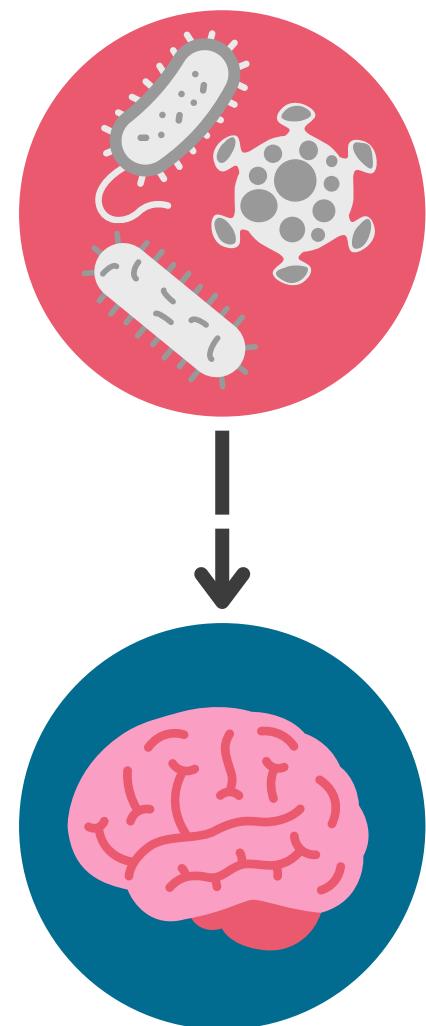


Microbiome remains age-dependent in middle childhood & adolescence

Moderated by adversity exposure

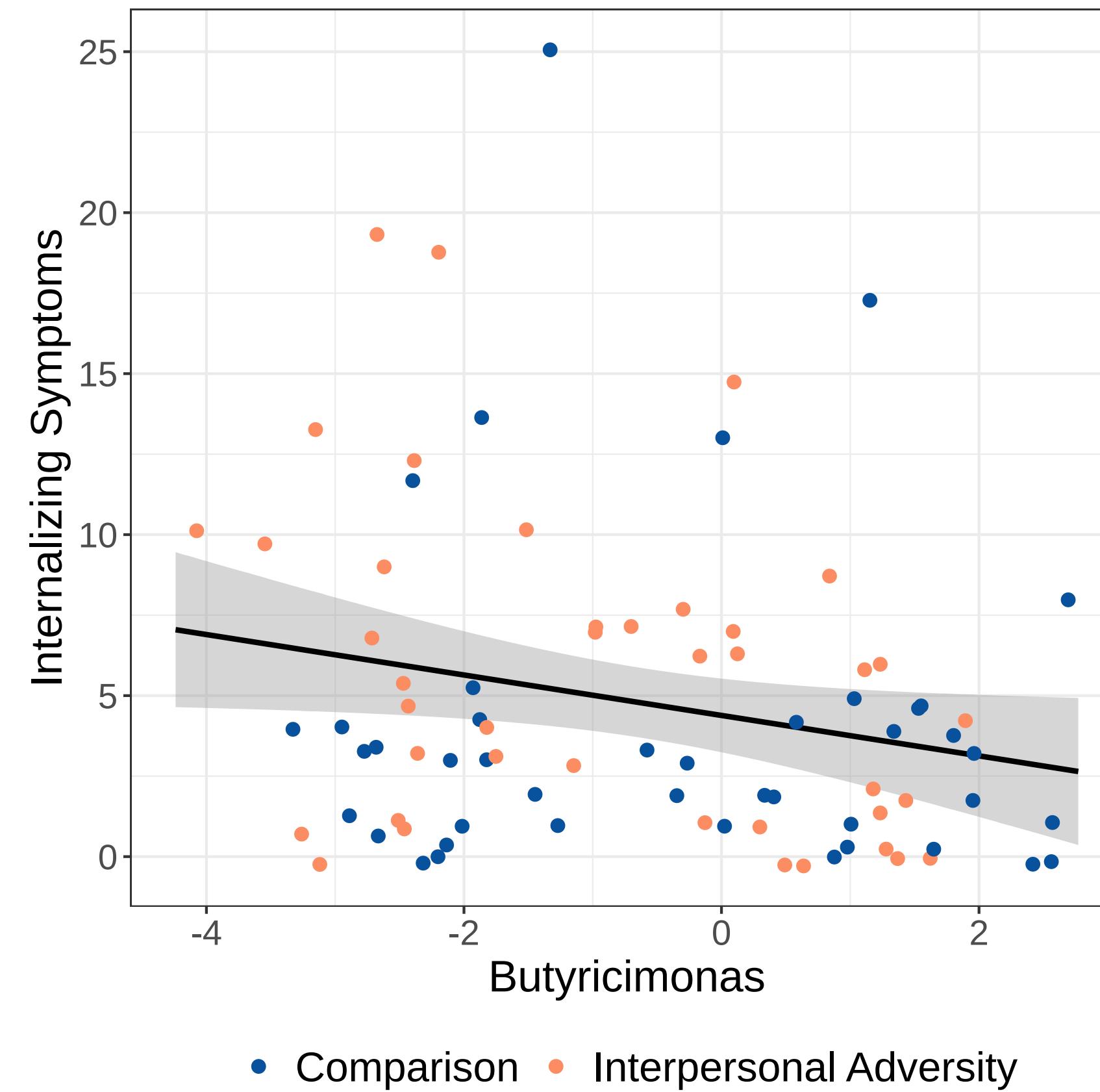


Microbiome &
Internalizing Sx

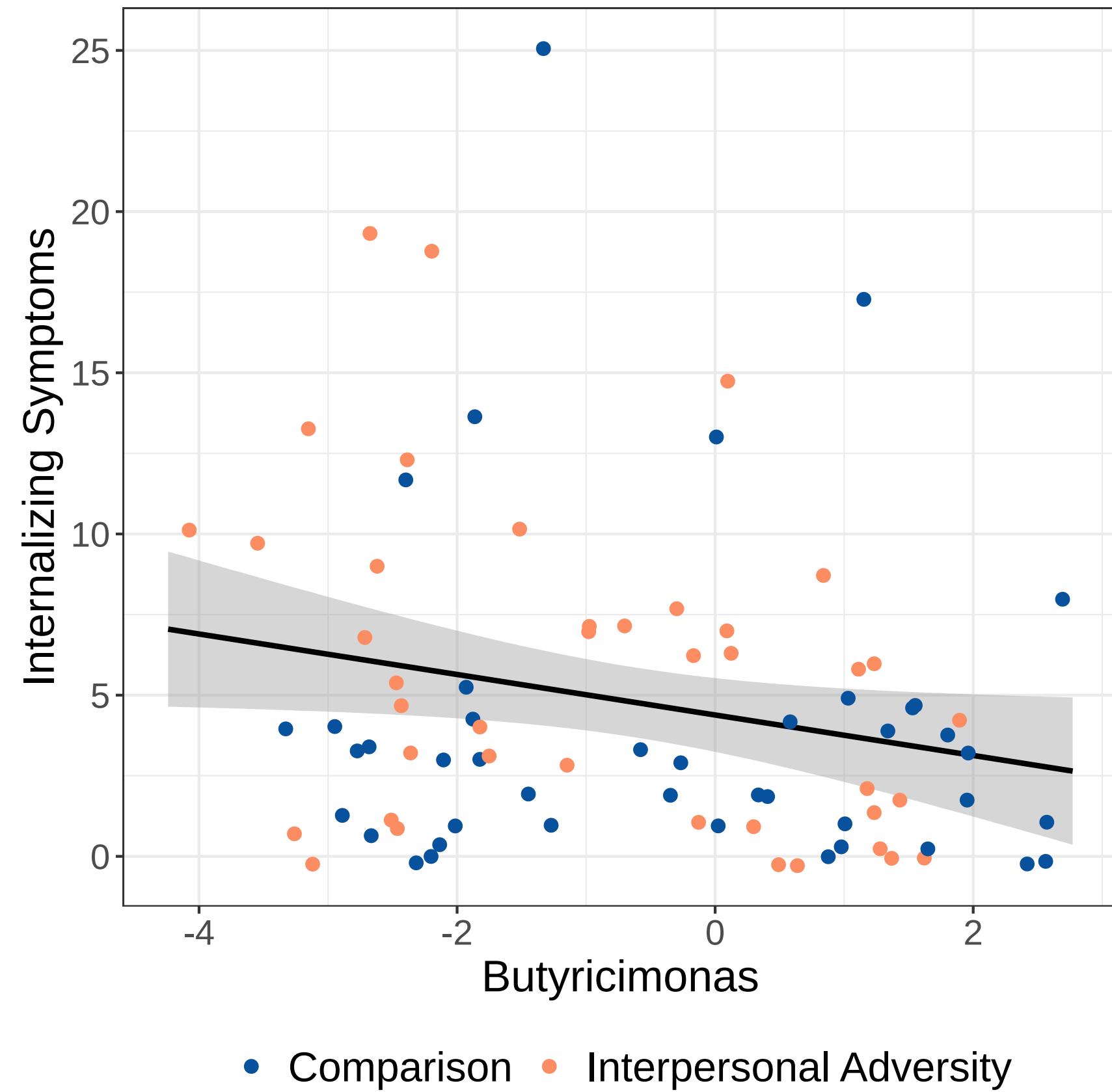


Microbiome &
Tissue Iron

$r = -0.271$

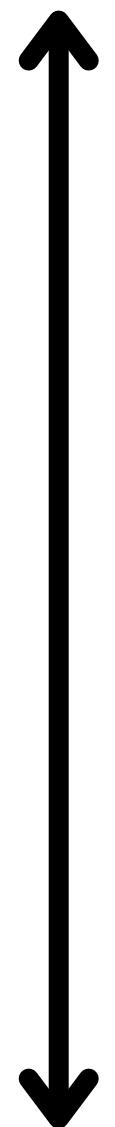


$$r = -0.271$$



SCFA
producer

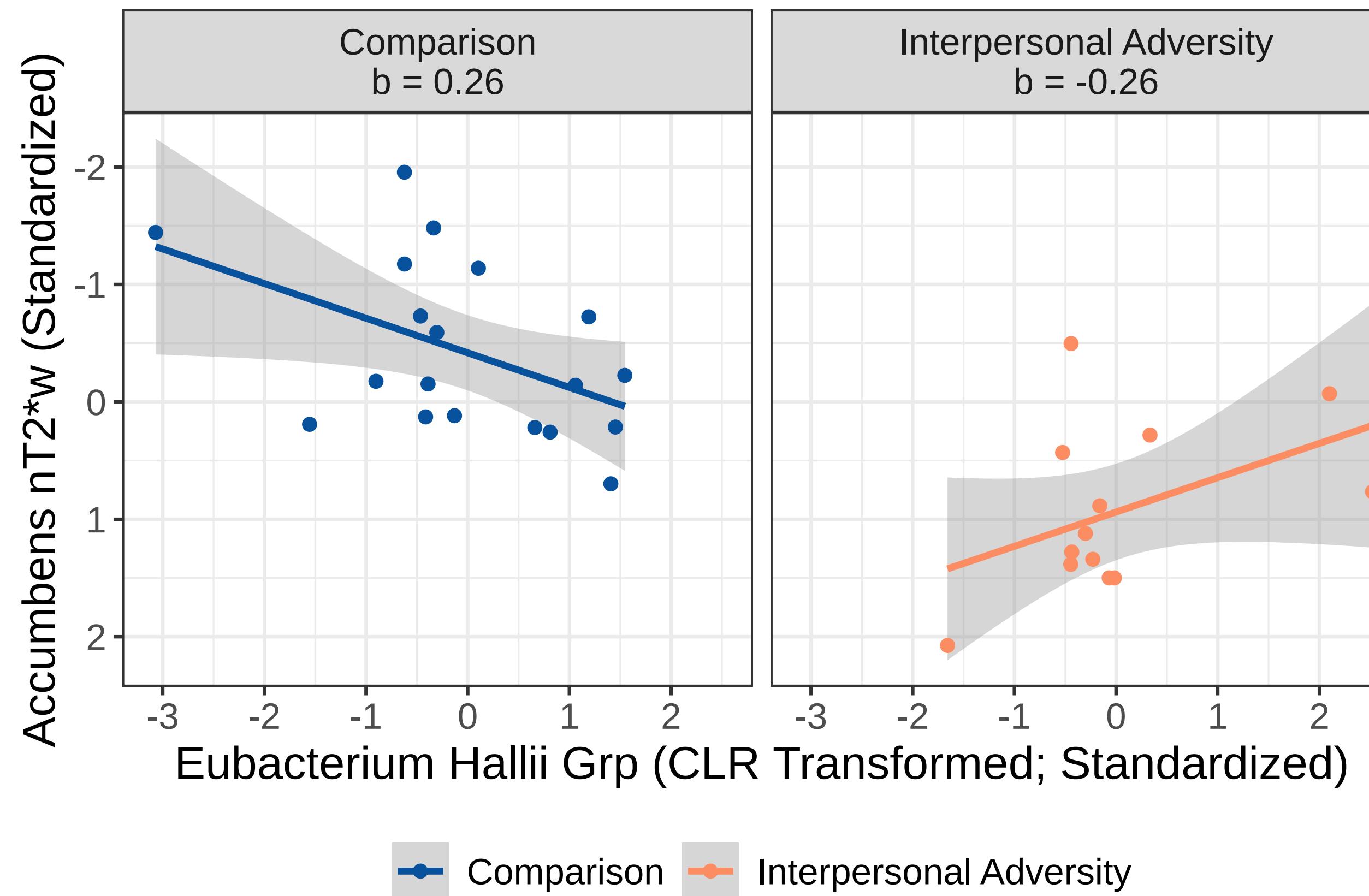
More
tissue iron

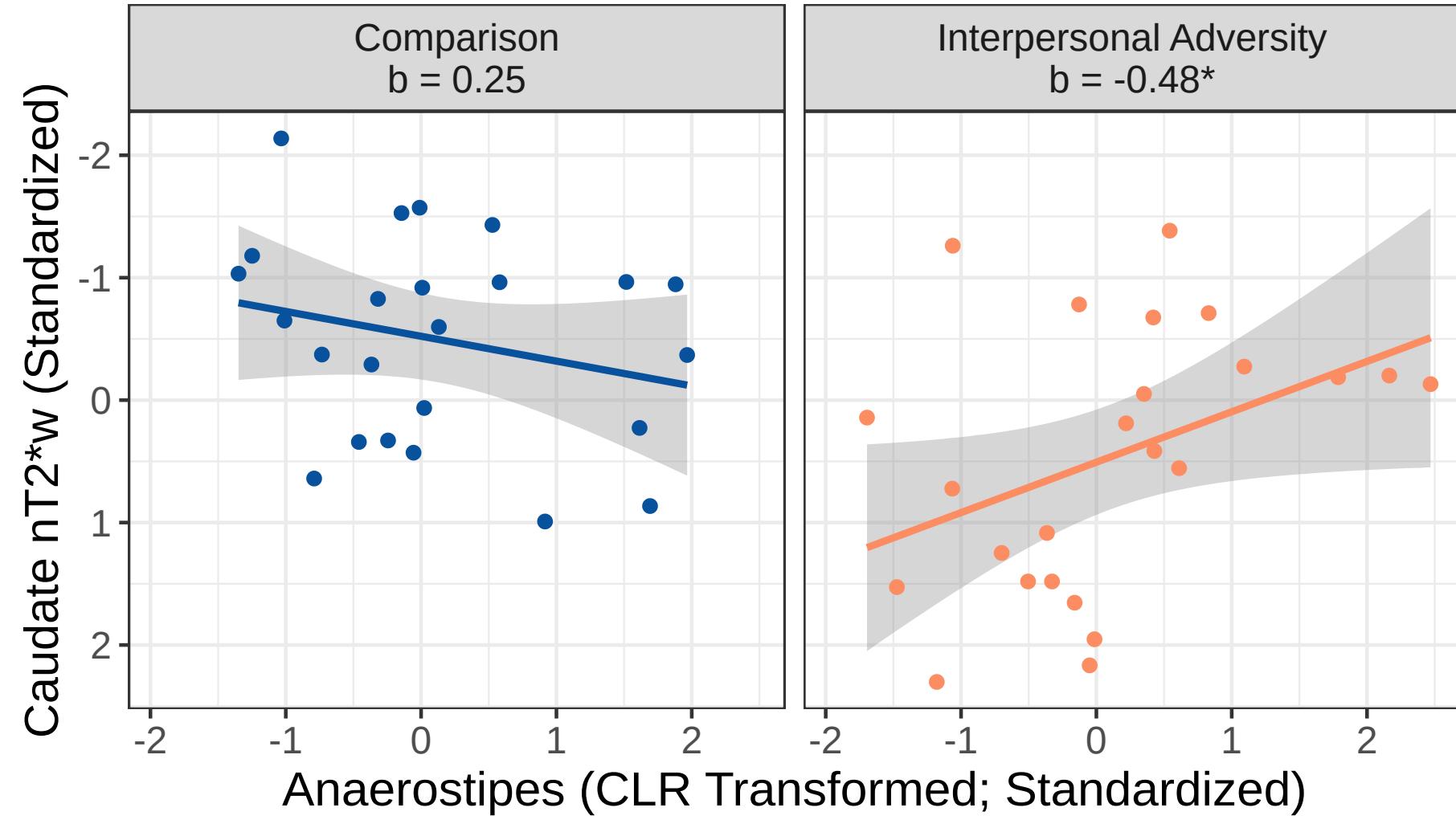


Less
tissue iron

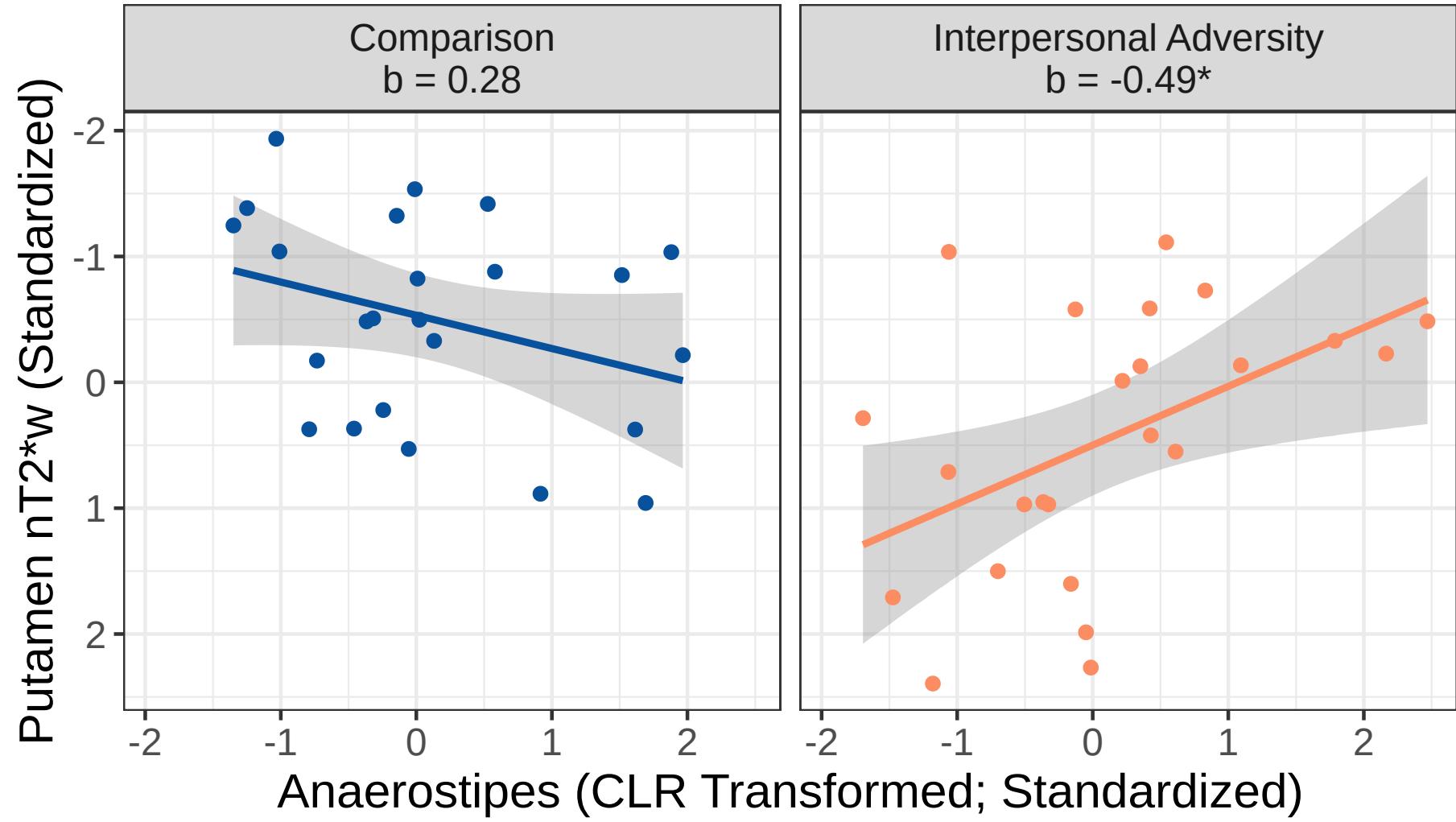
More
tissue iron

Less
tissue iron

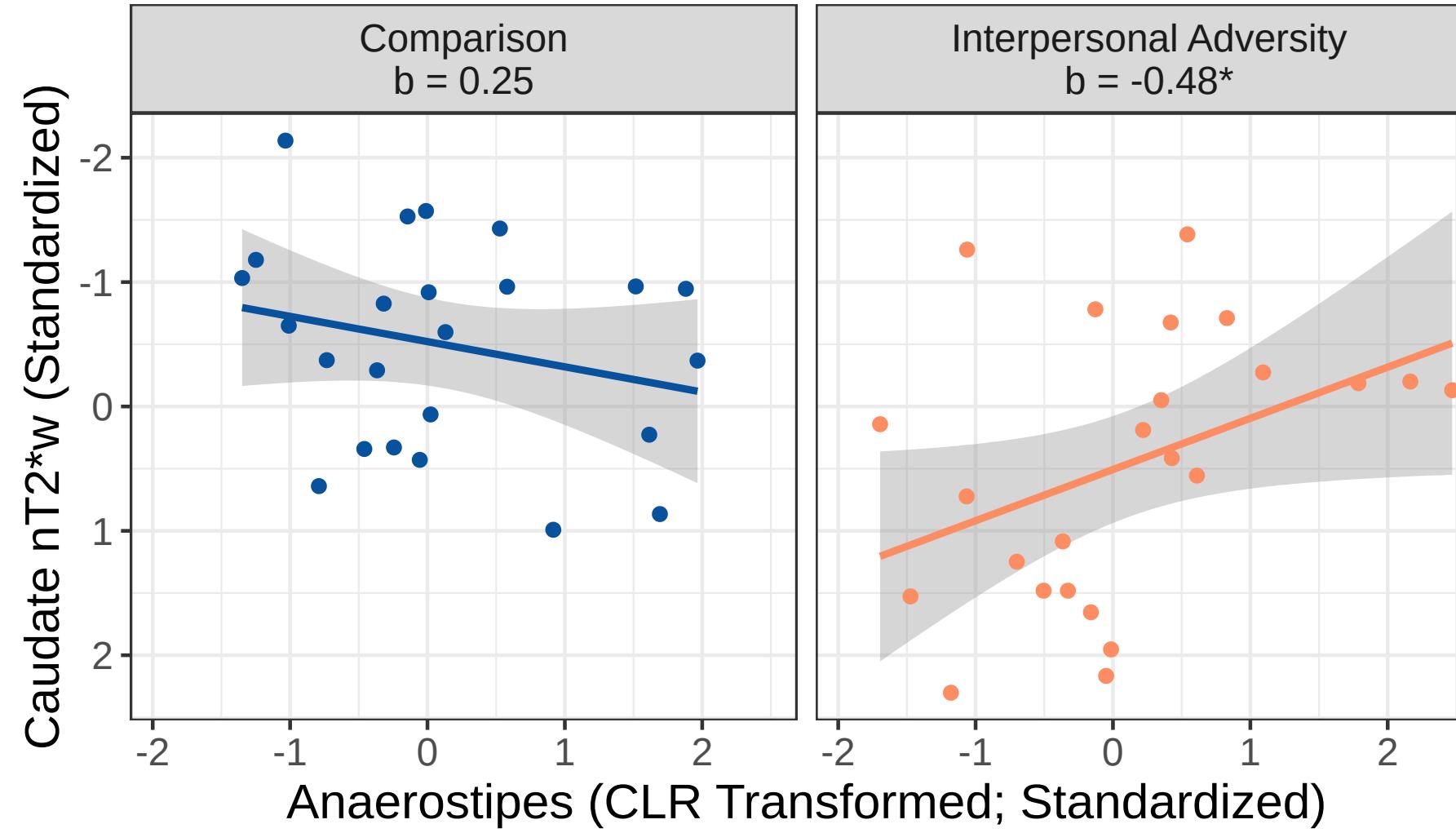




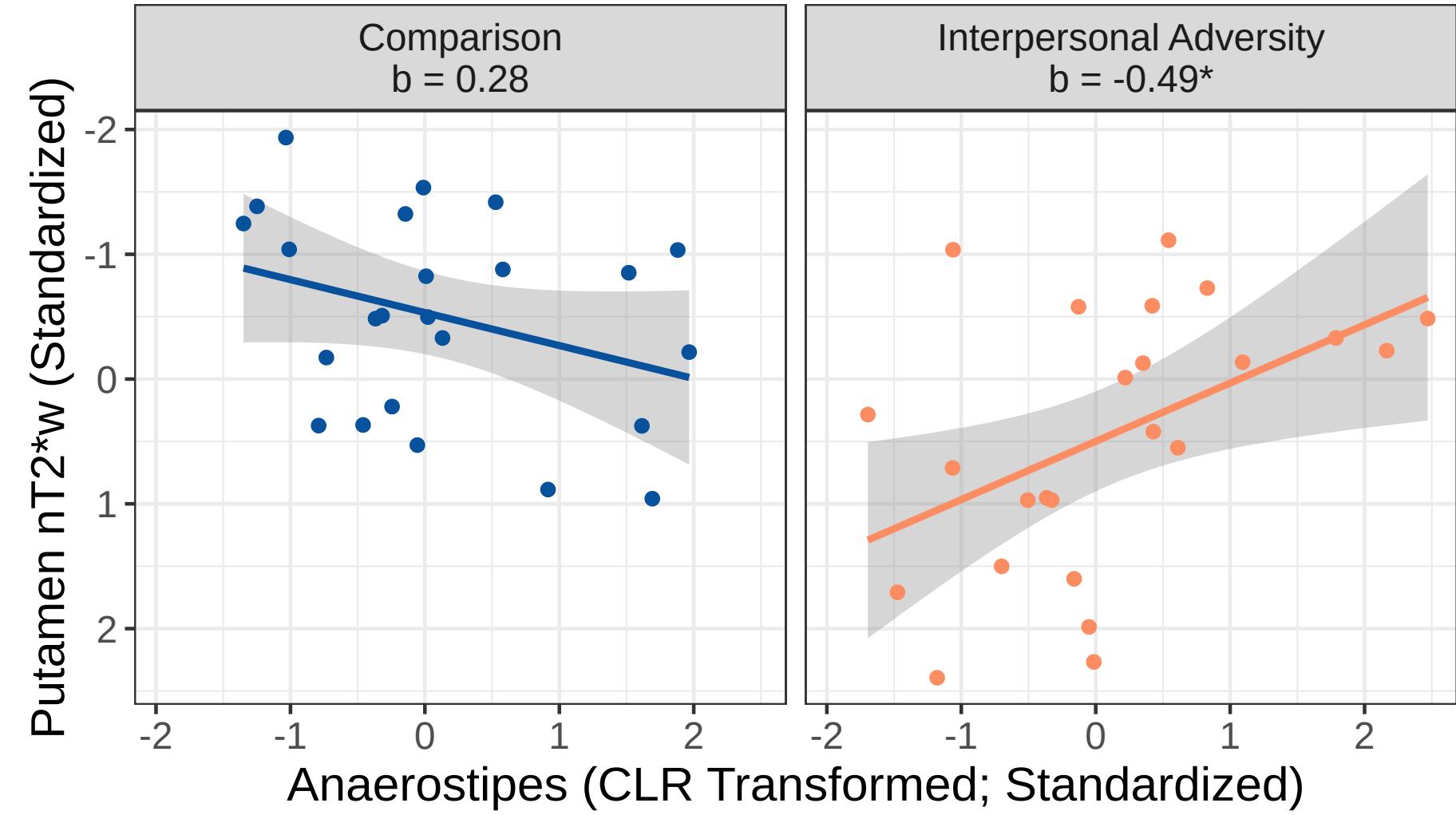
Comparison Interpersonal Adversity



Comparison Interpersonal Adversity

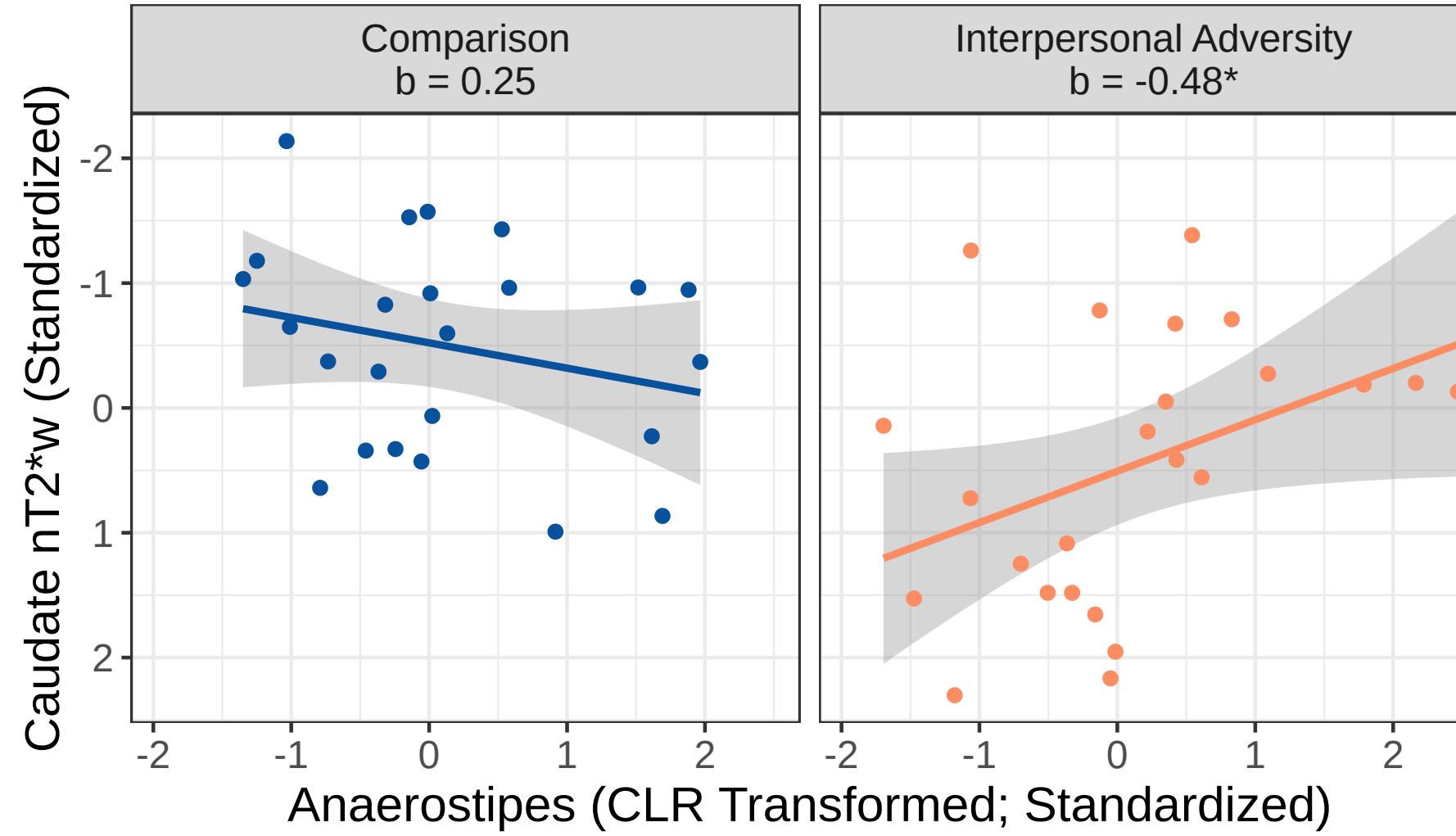


Comparison Interpersonal Adversity

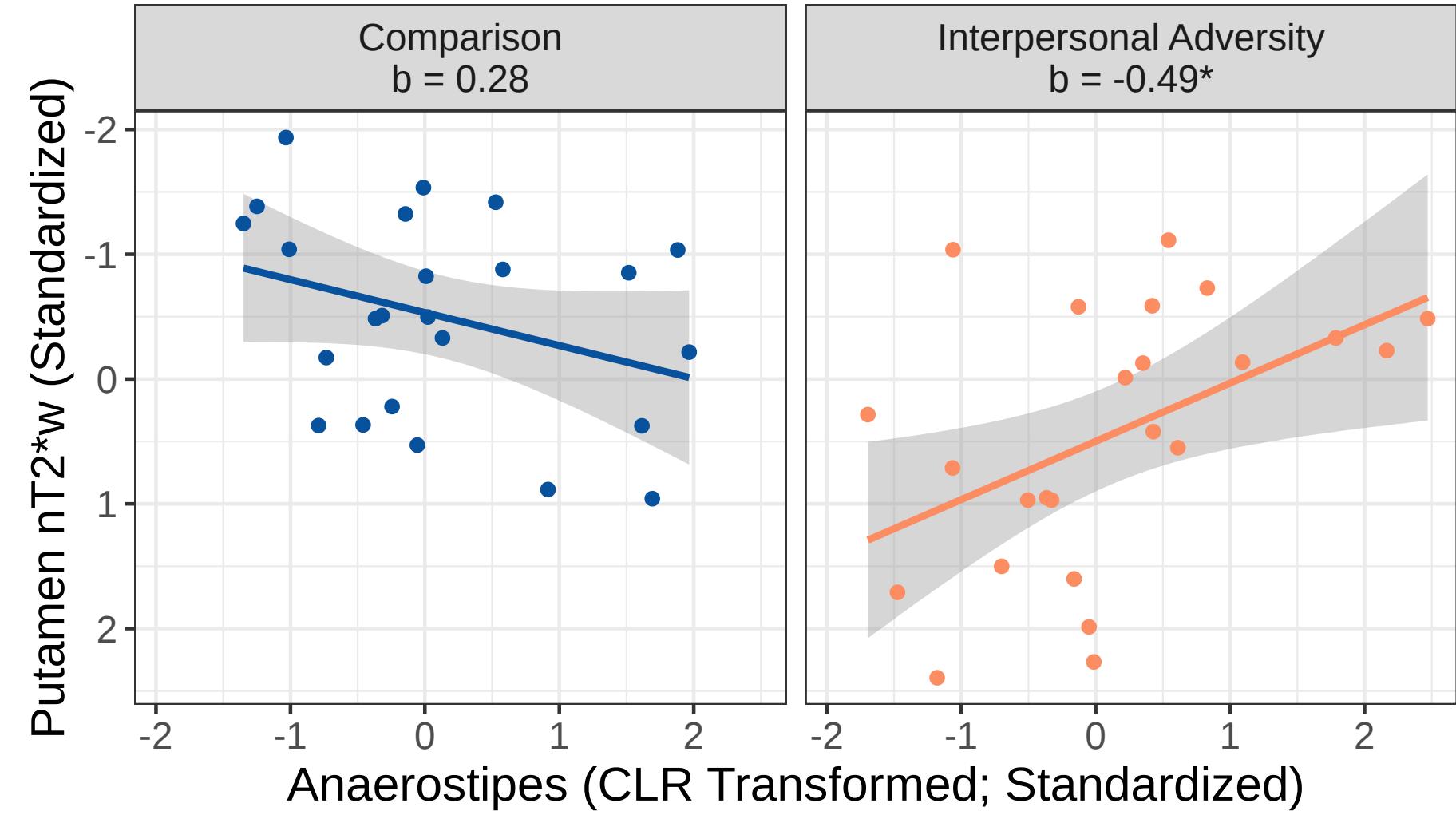


Comparison Interpersonal Adversity

We saw this with 6 bacteria in *Clostridia* class



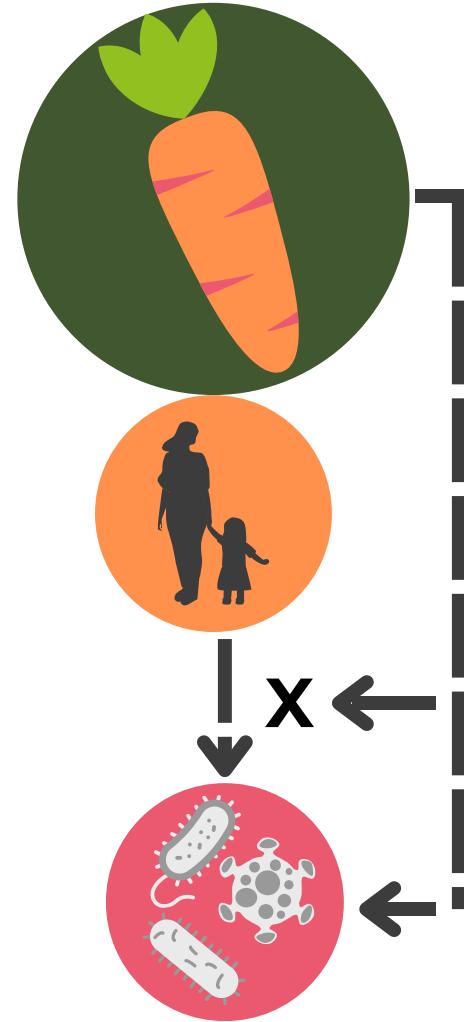
Comparison Interpersonal Adversity



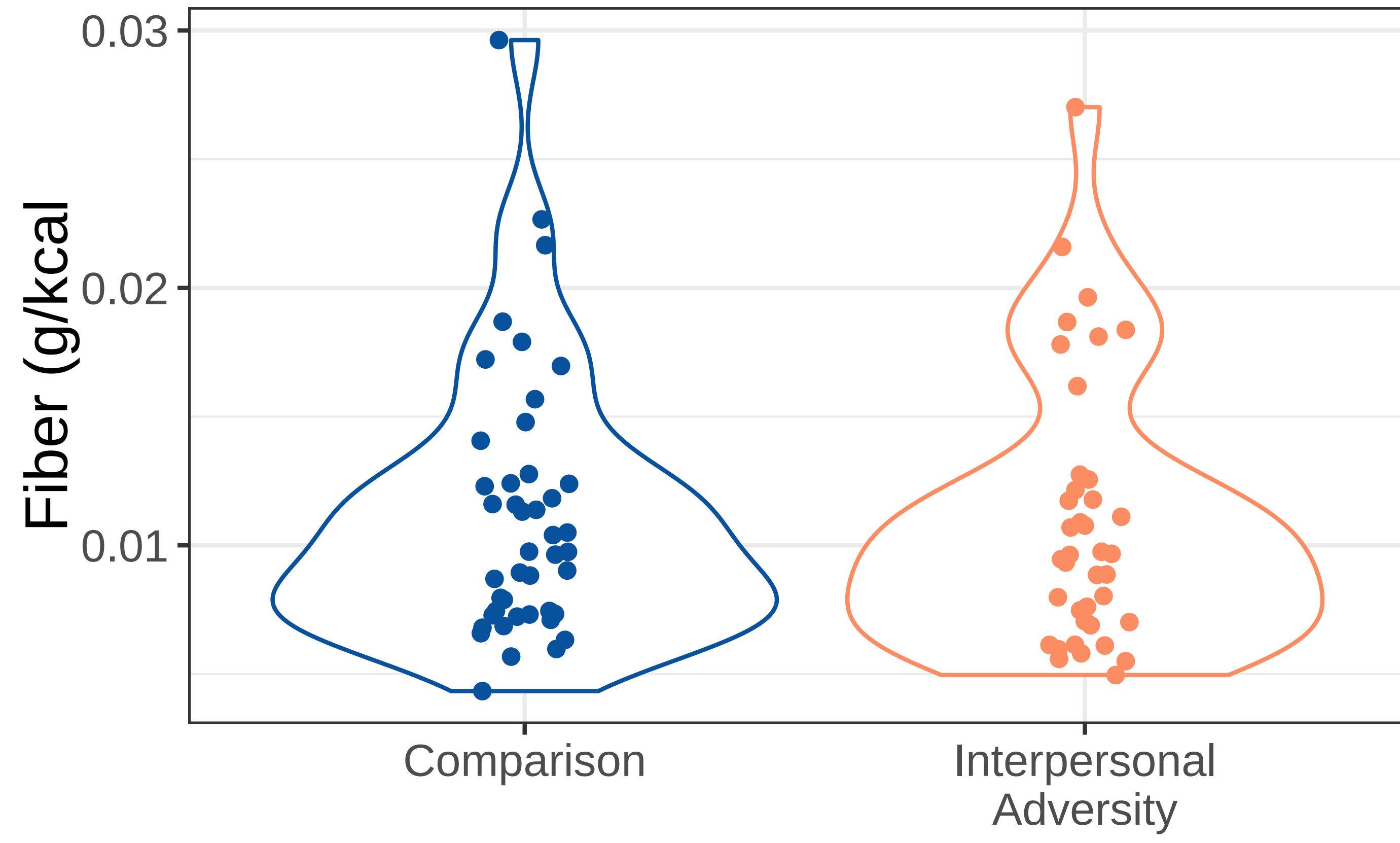
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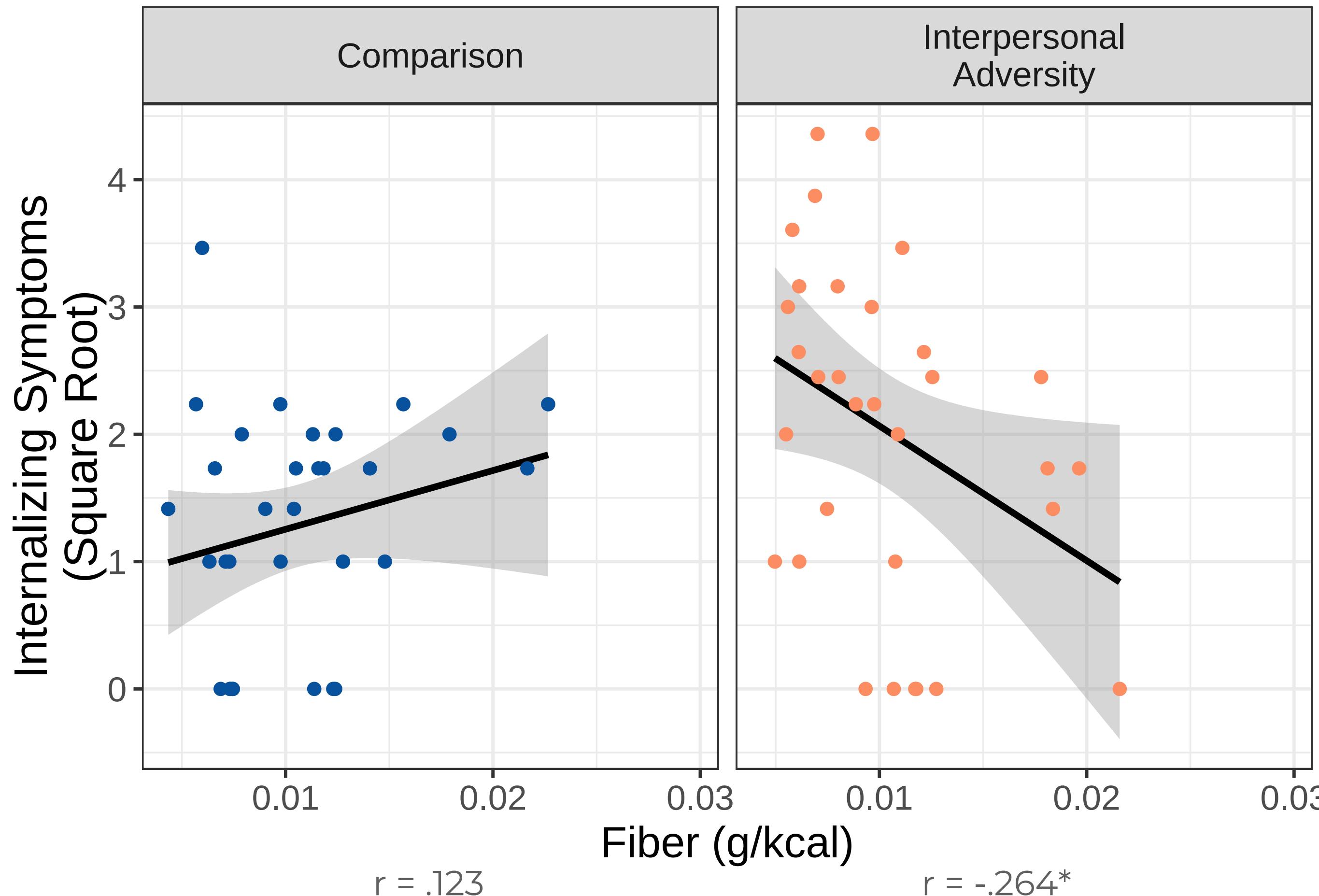
Renormalizing effect?

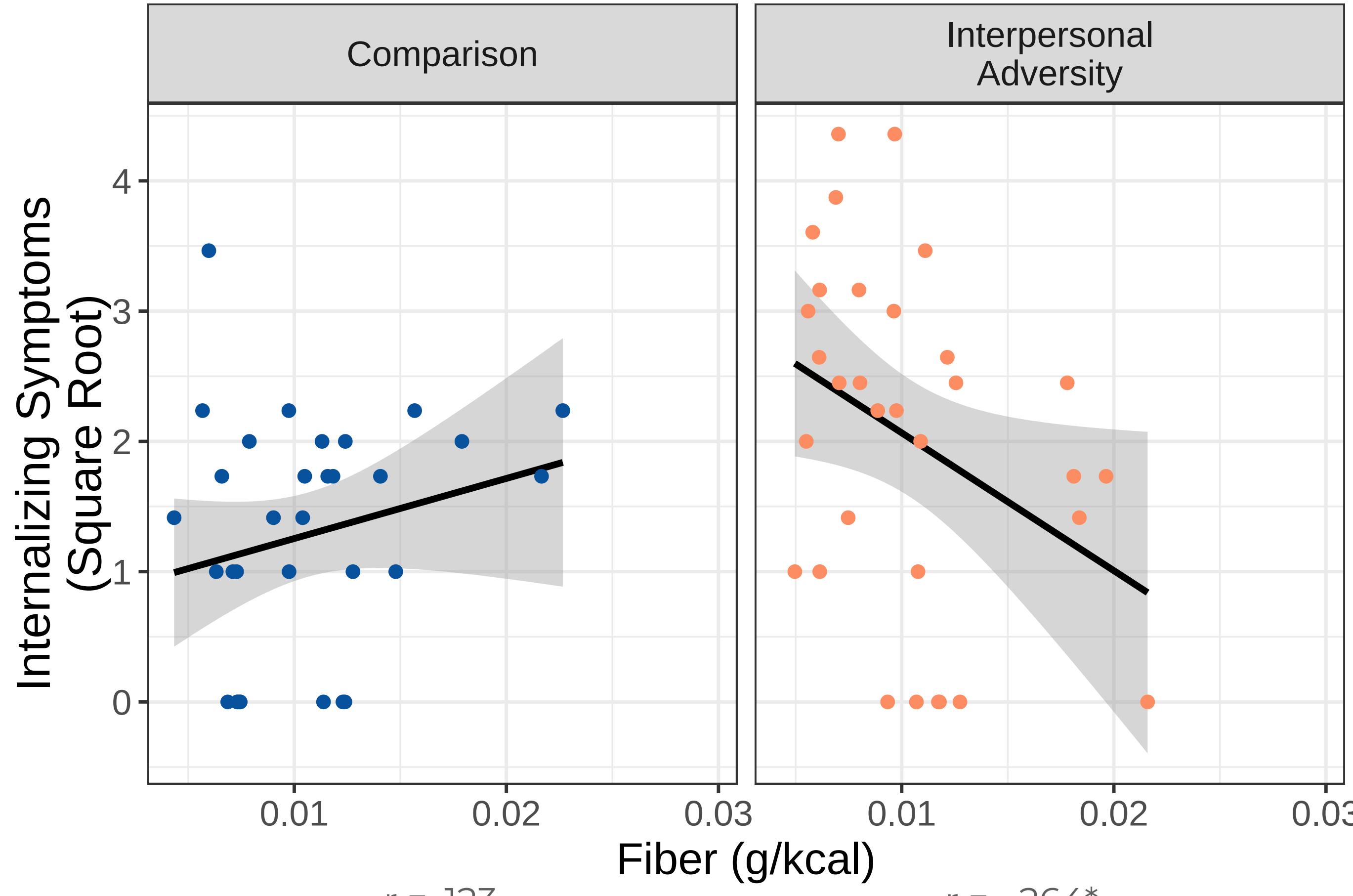


Diet as
Mitigator



$p = .85$

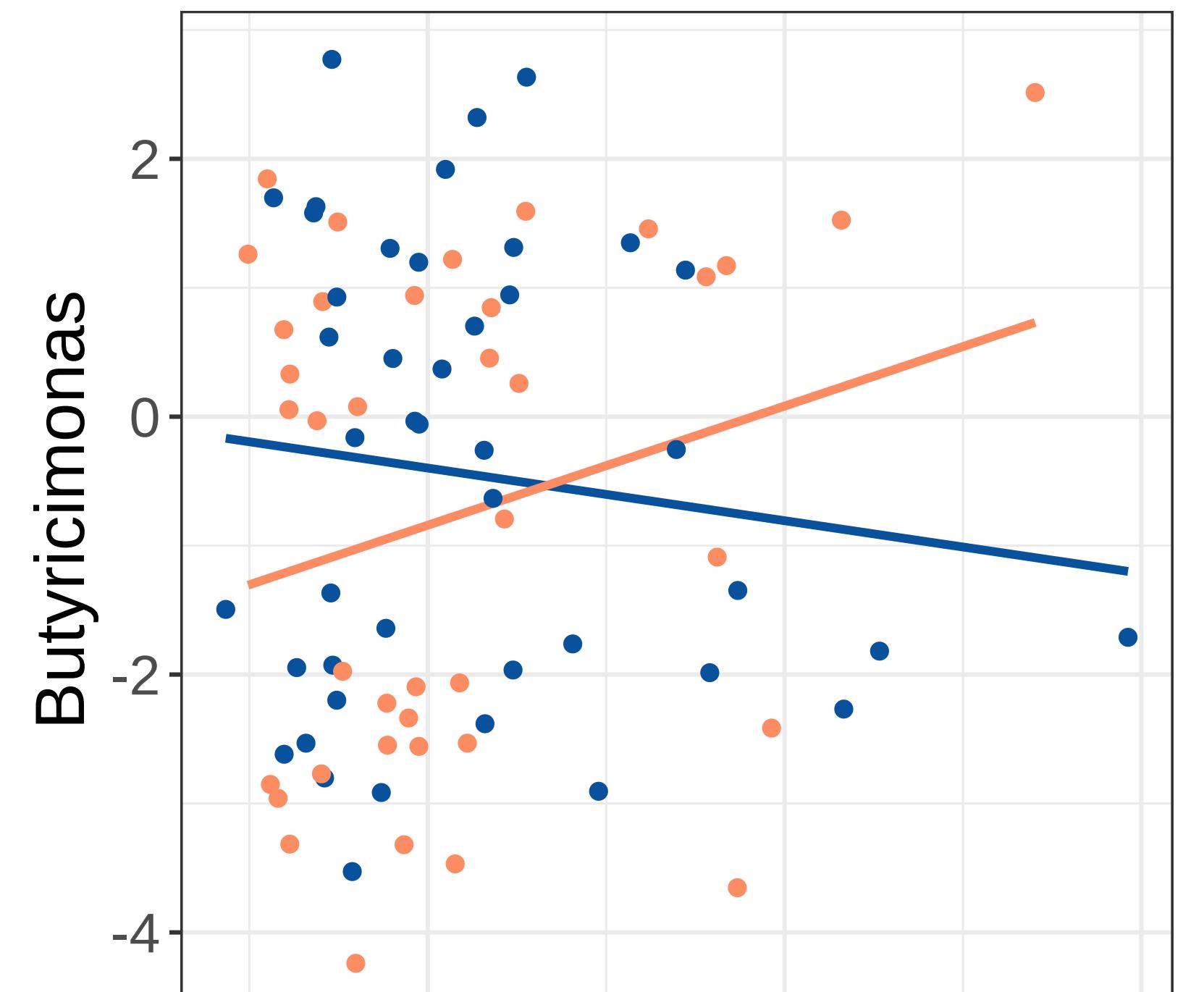




Is the gut microbiome responding differently?

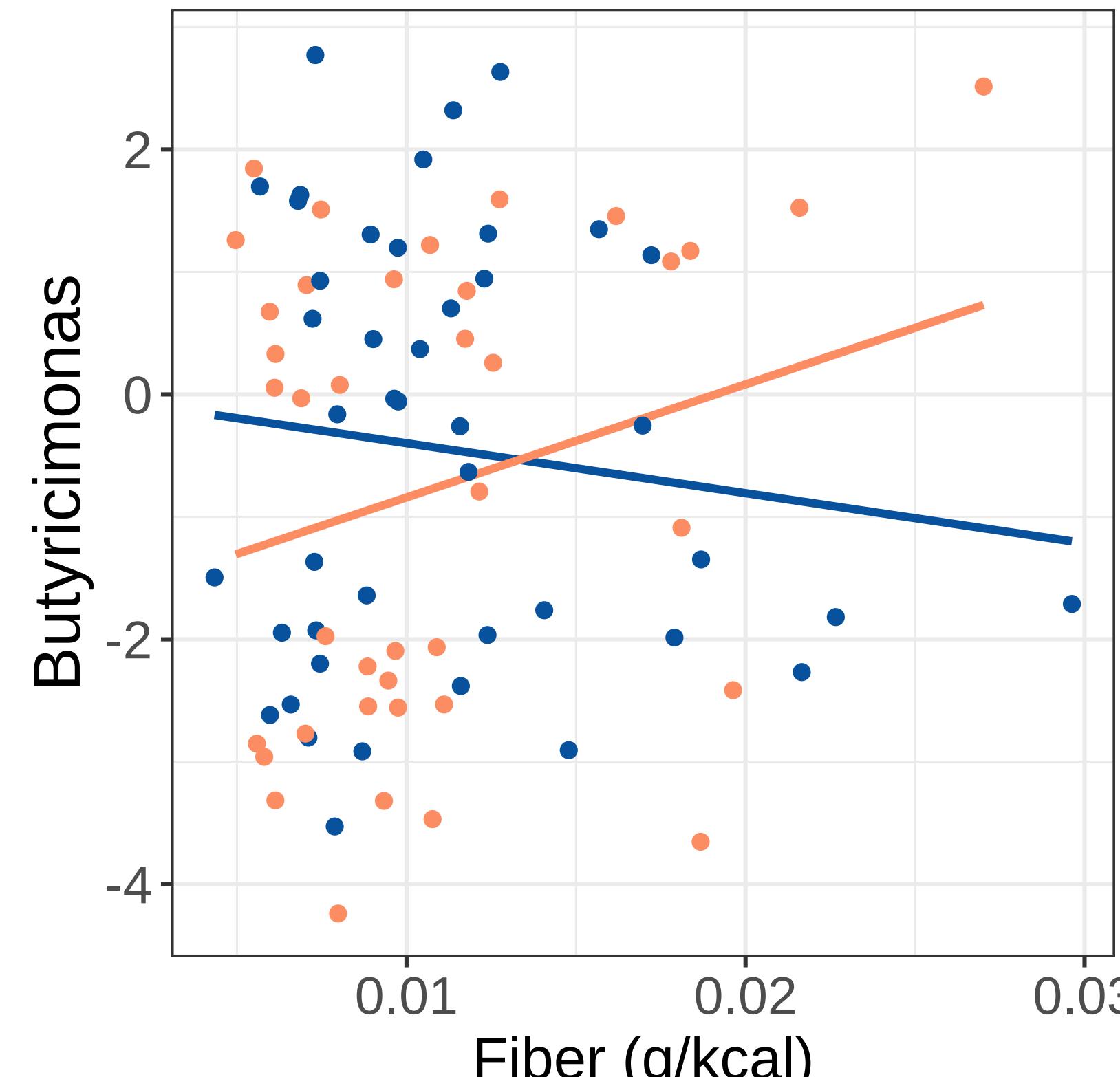
Gancz et al., In prep

$r = .217$

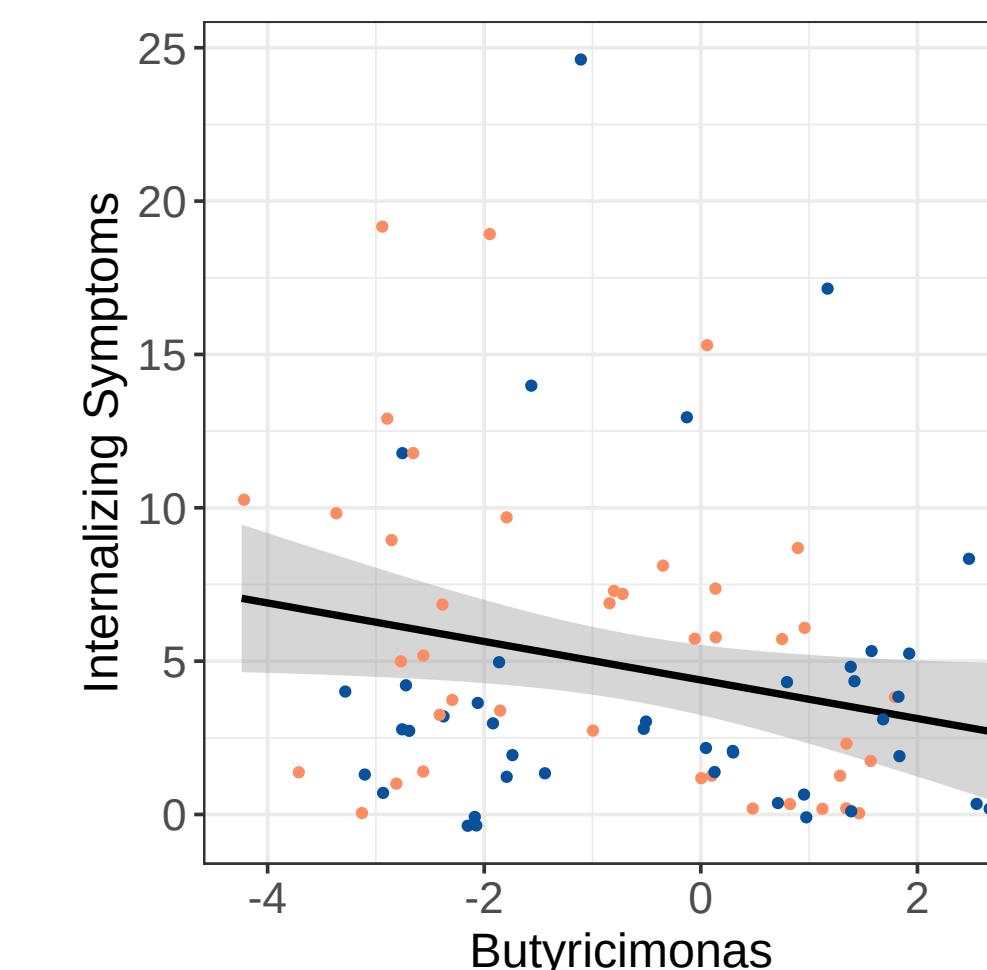


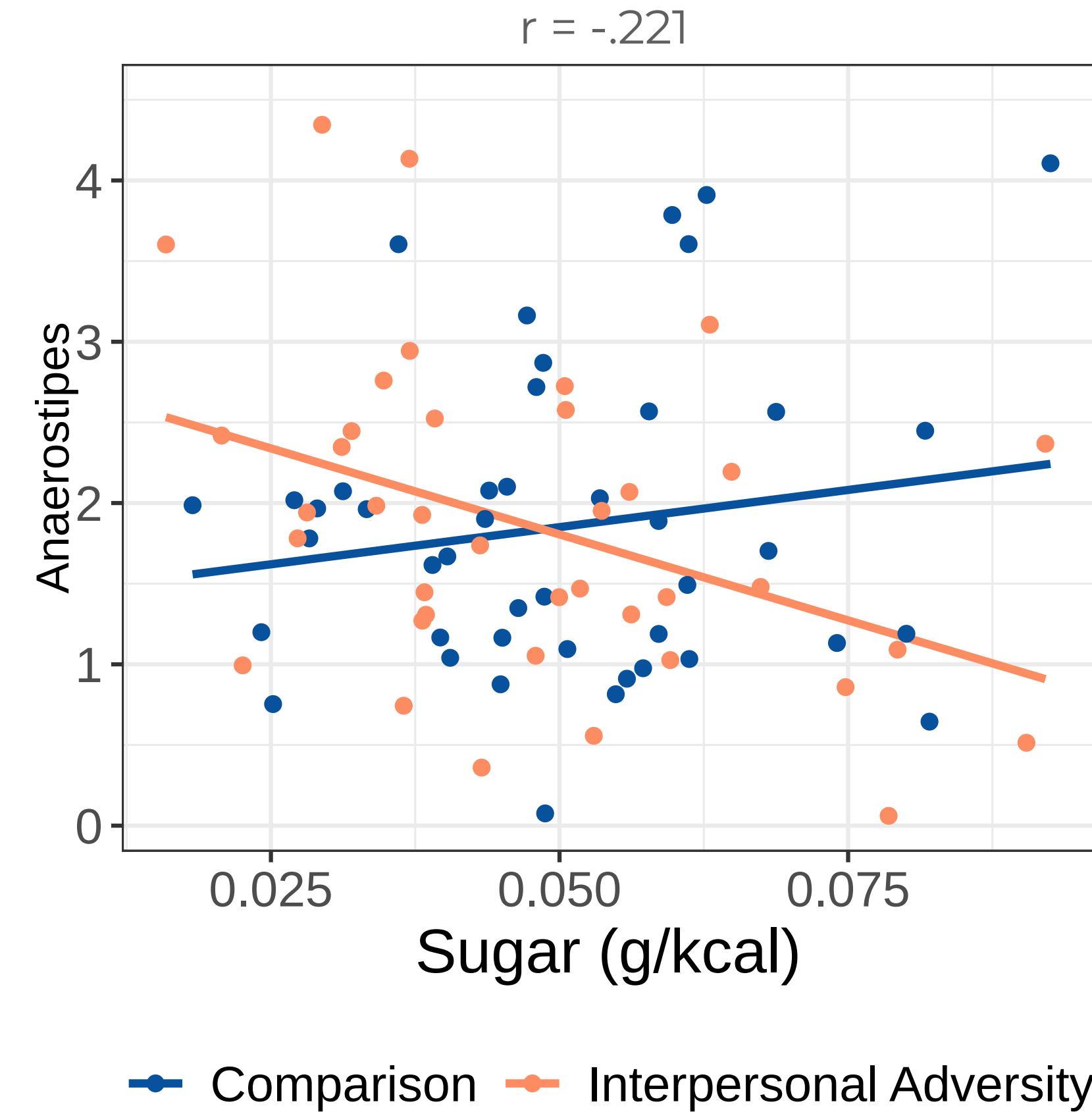
● Comparison ● Interpersonal Adversity

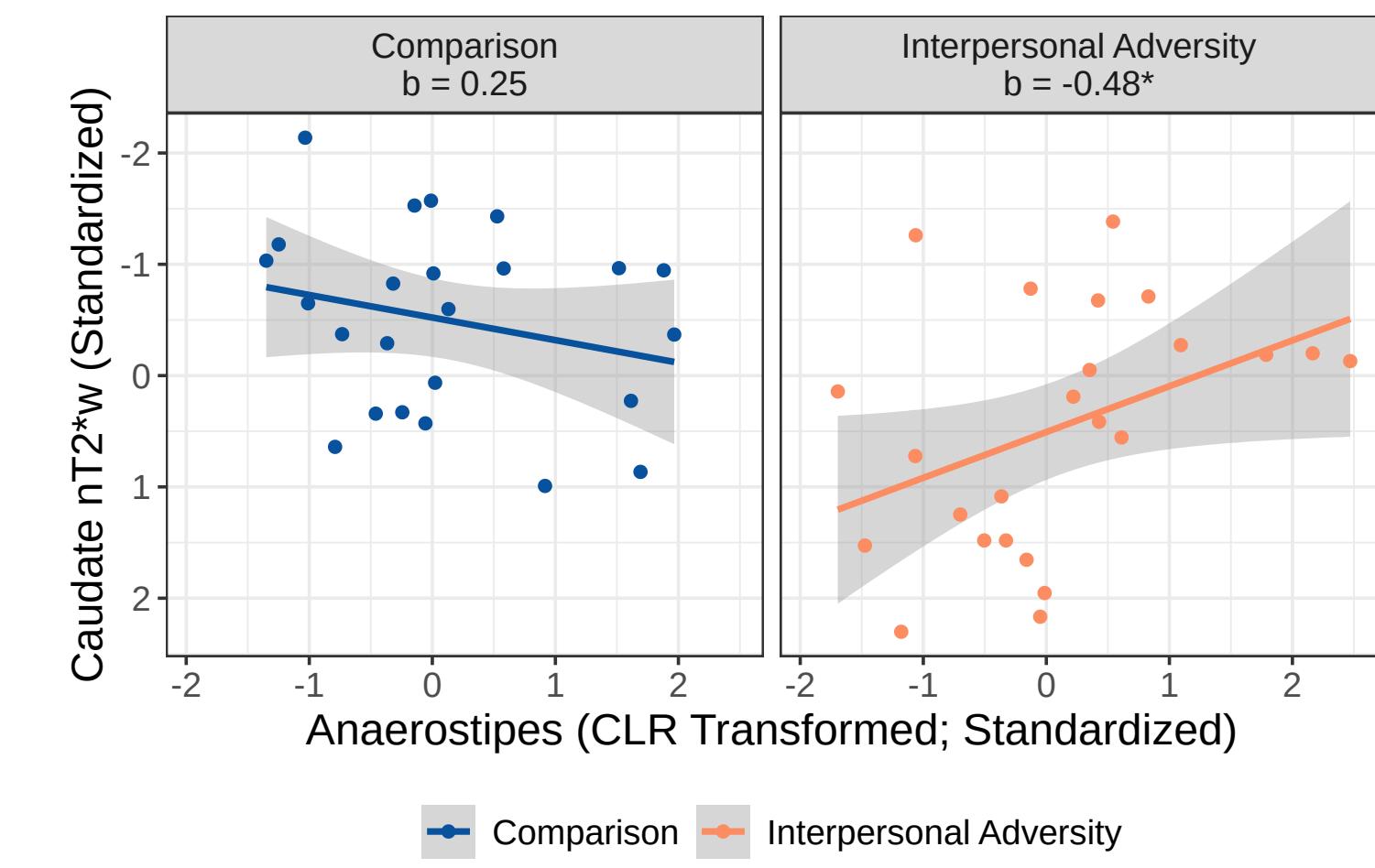
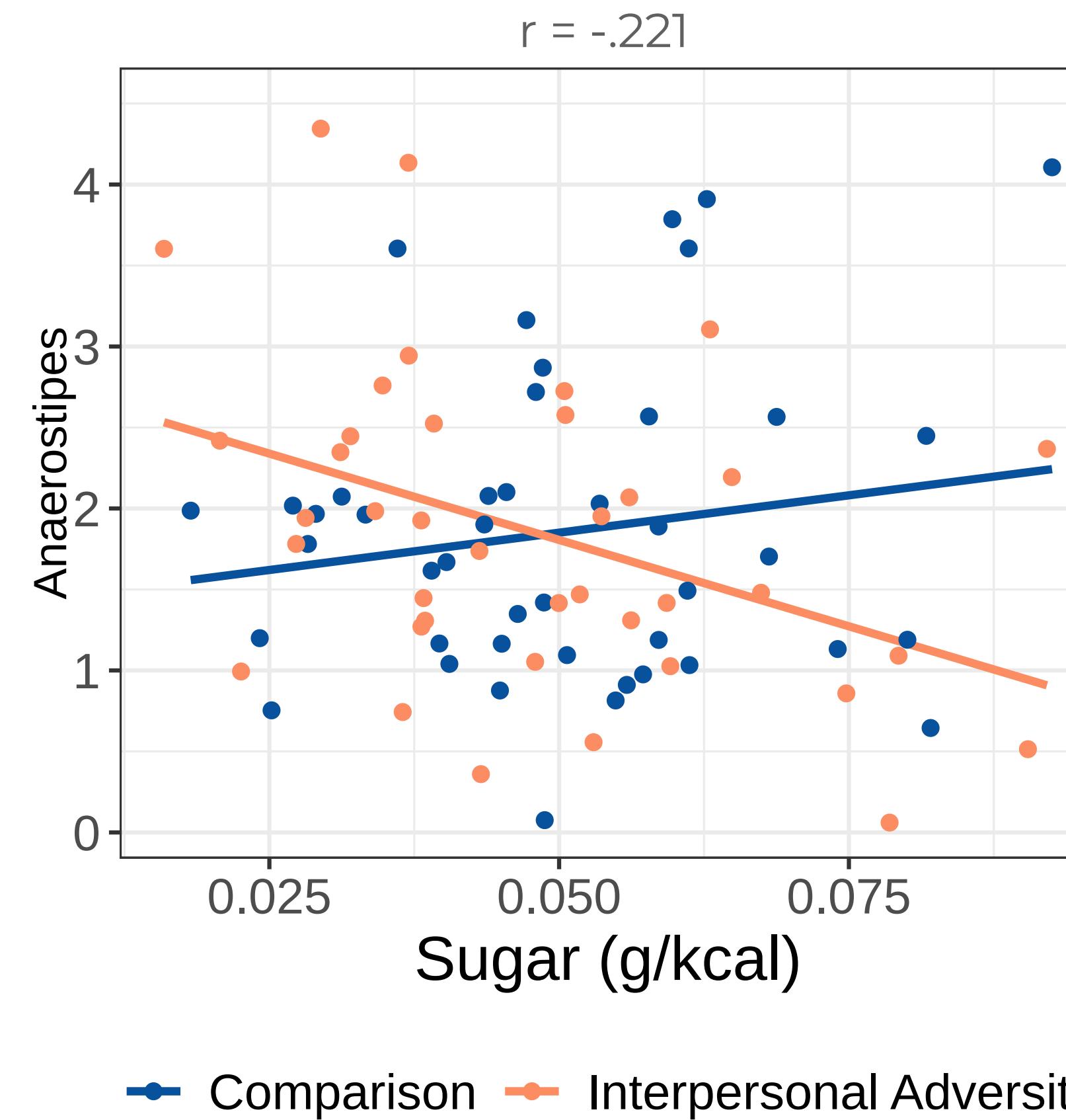
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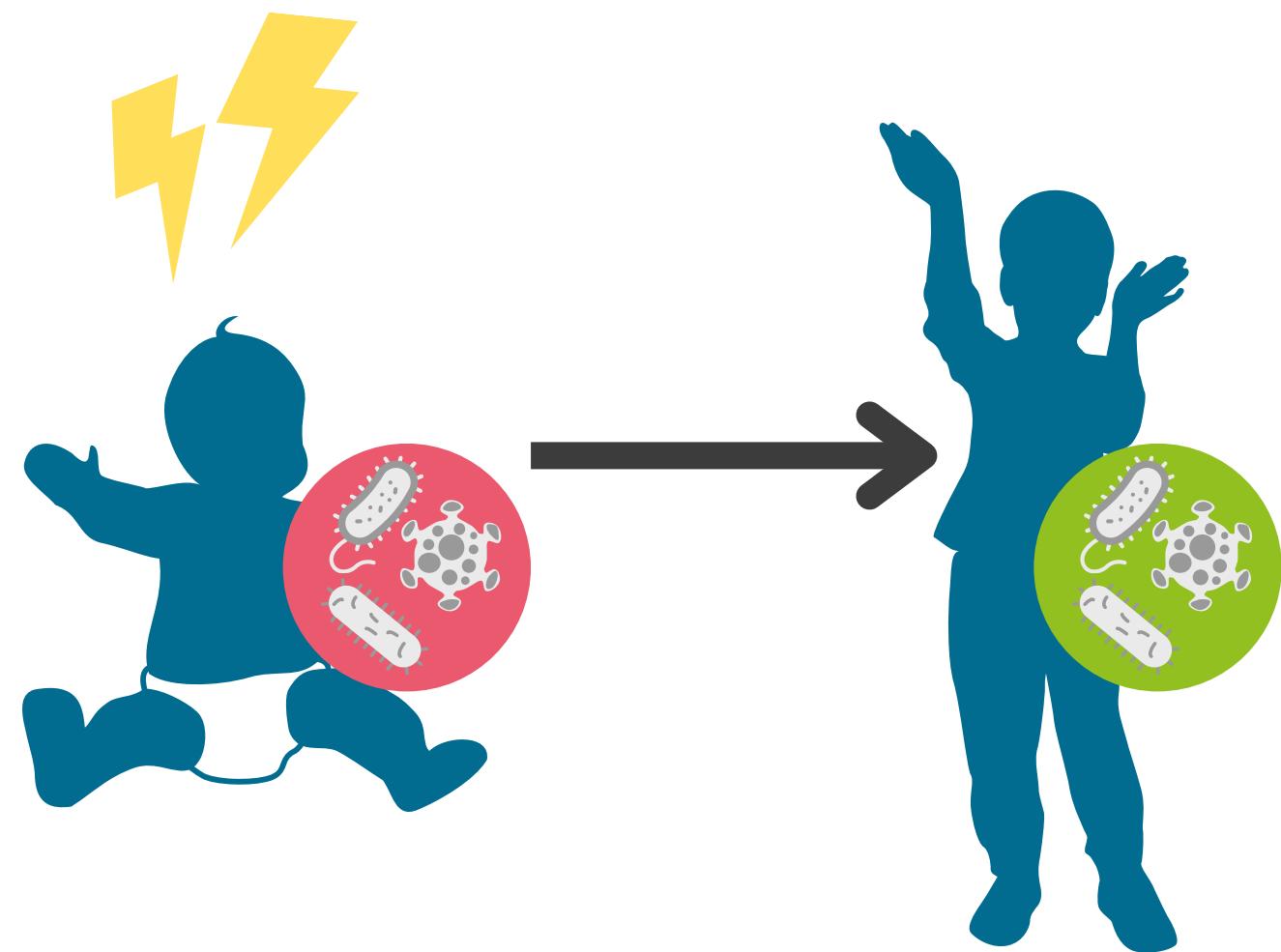






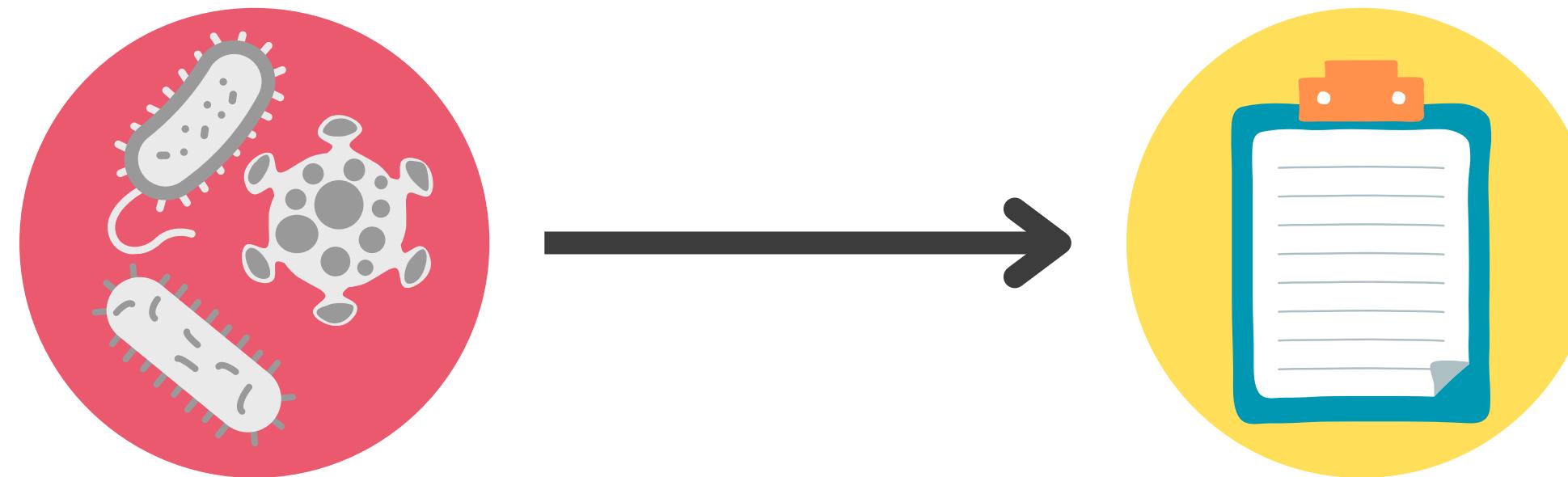
Takeaways:

- Microbiome remains age & adversity-dependent throughout middle childhood/adolescence



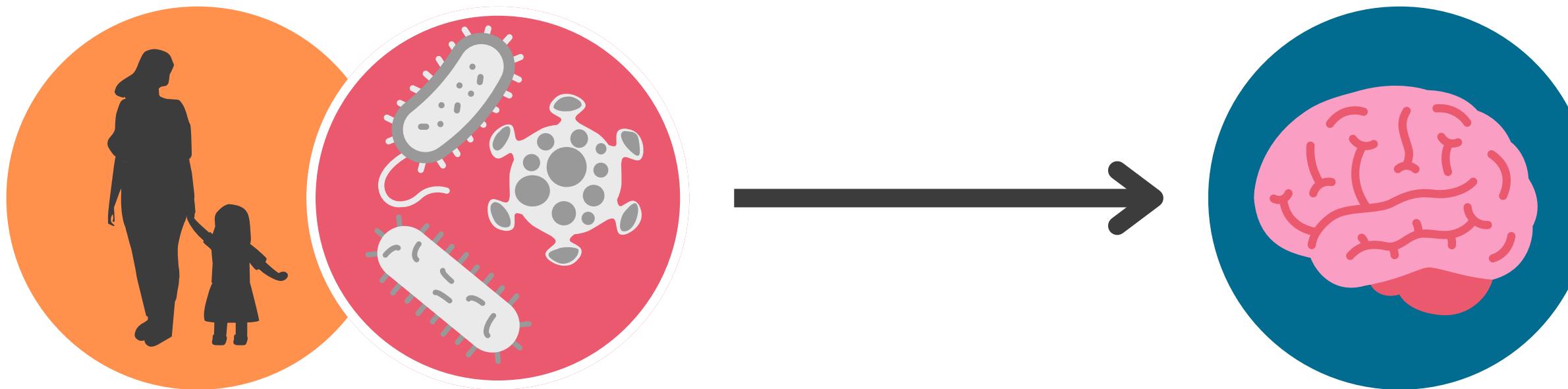
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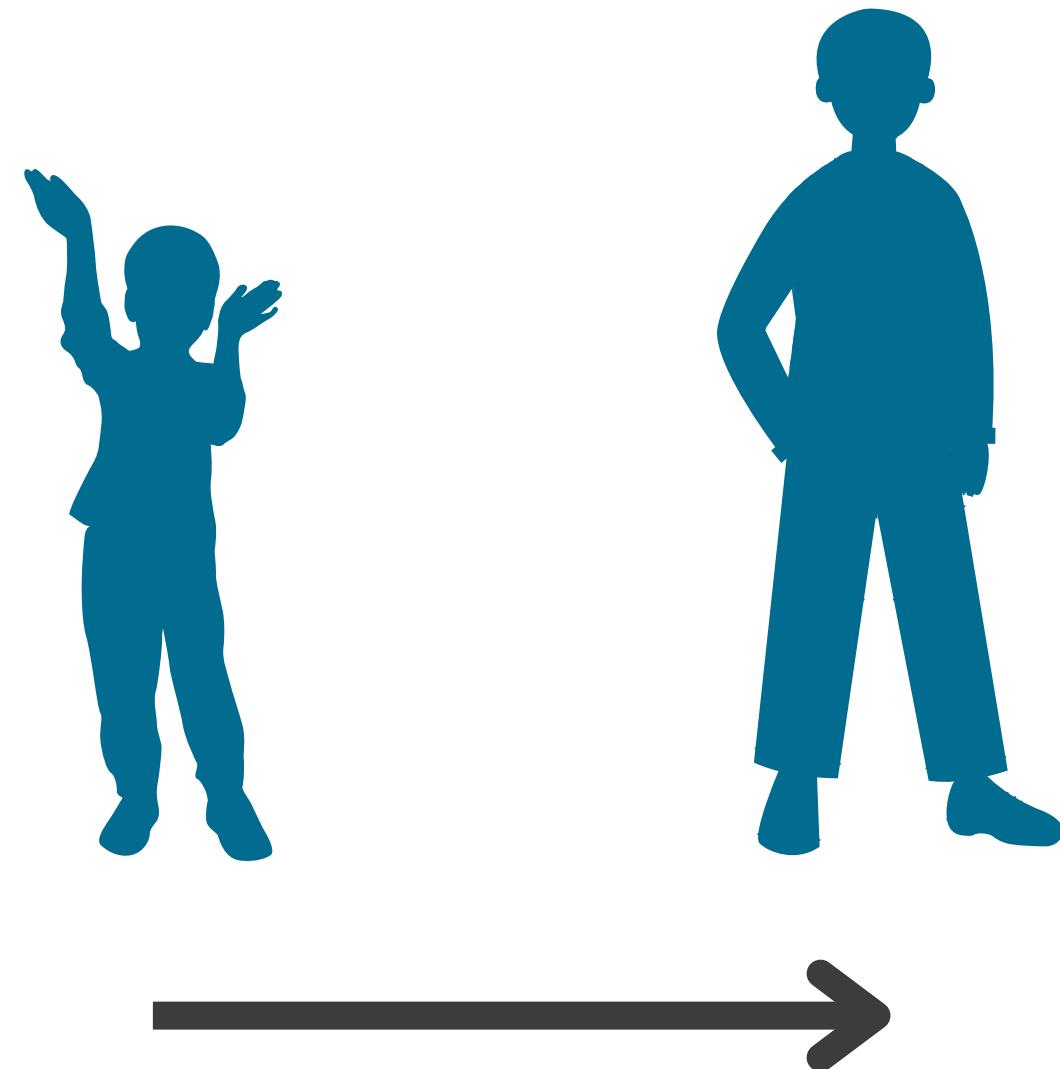
Takeaways:

- Microbiome remains age & adversity-dependent throughout middle childhood/adolescence
- Higher SCFA-producing bacteria ~ lower internalizing sx
- IA-exposed kids w/more of certain *Clostridia*: higher tissue iron
- IA-exposed kids w/healthy diet have more beneficial bacteria



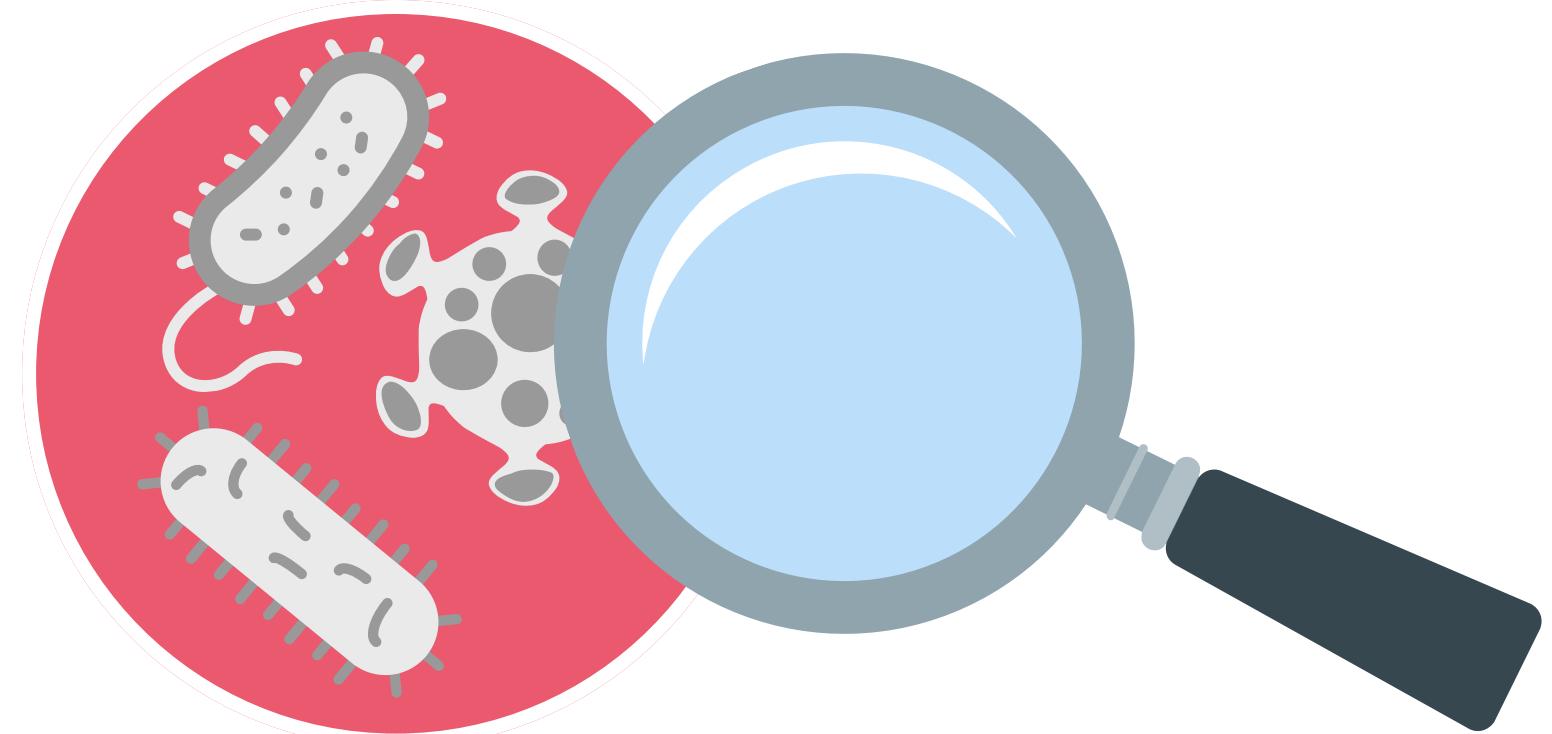
Future Directions:

- Longitudinal data



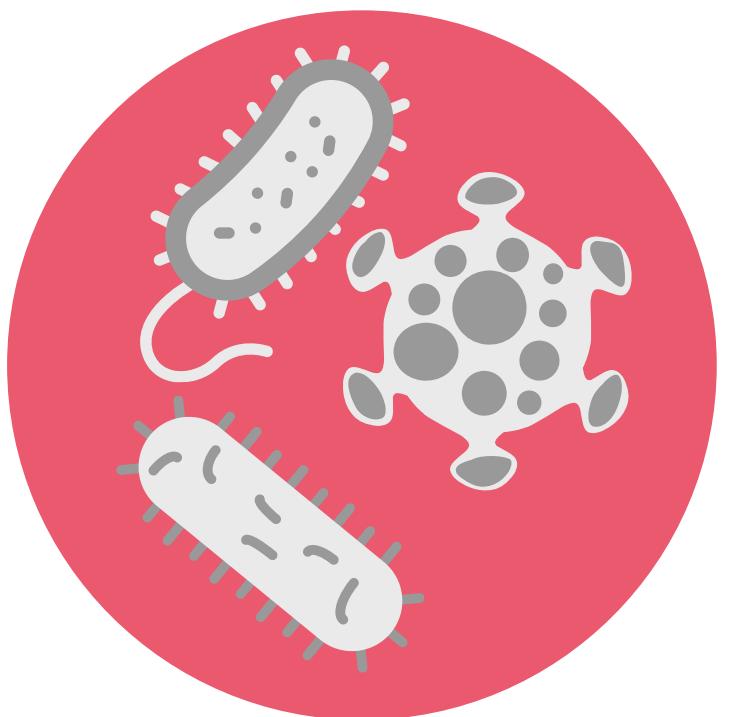
Future Directions:

- Longitudinal data
- Higher-resolution measures



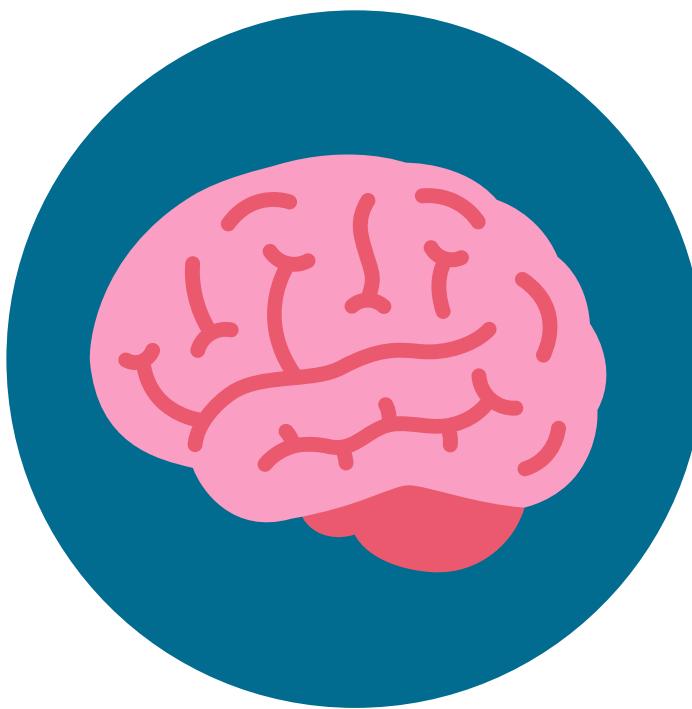
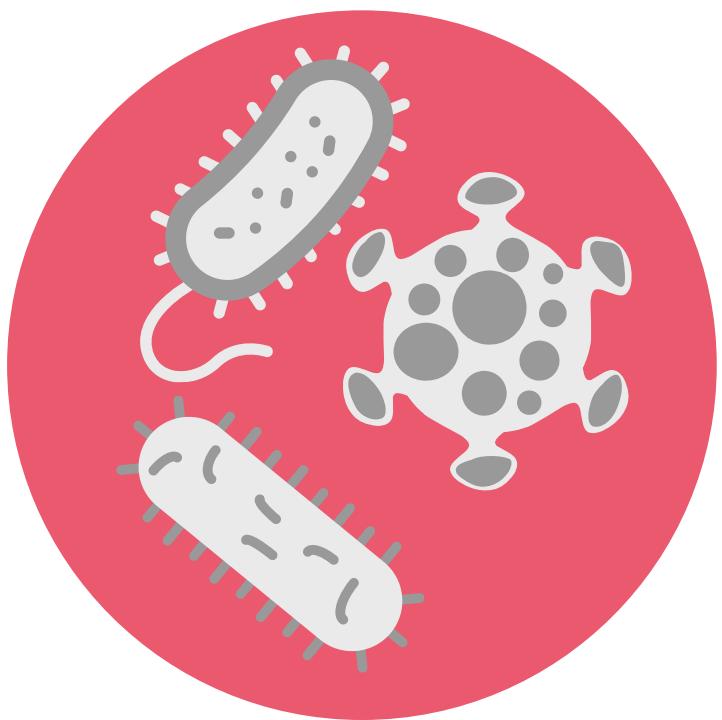
Future Directions:

- Longitudinal data
- Higher-resolution measures
- Multiple data types



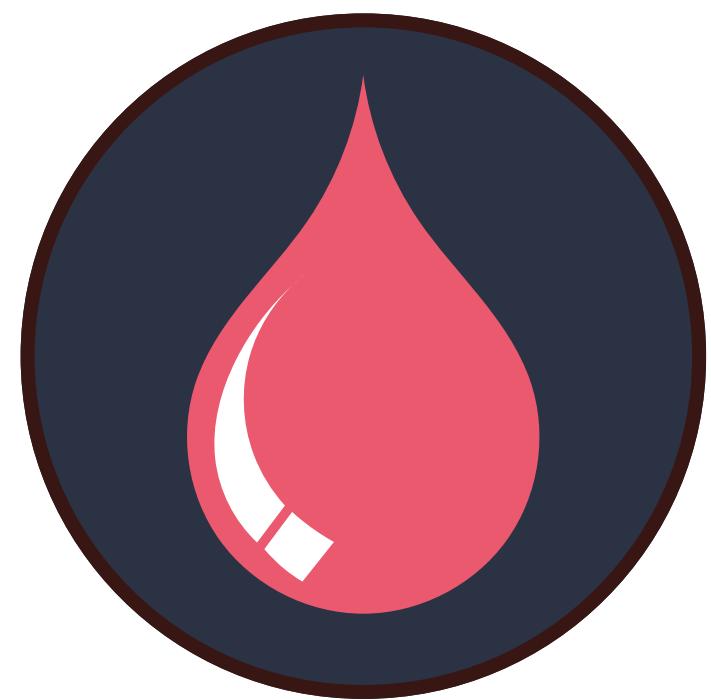
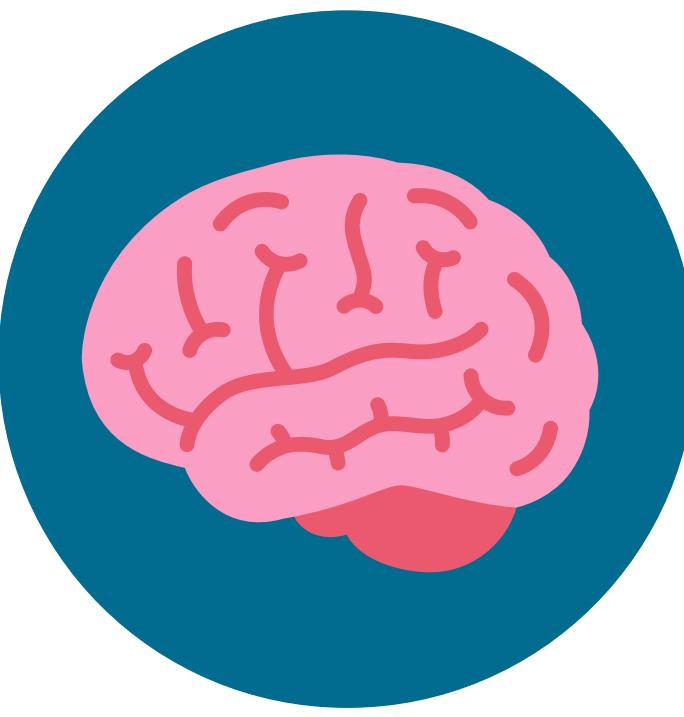
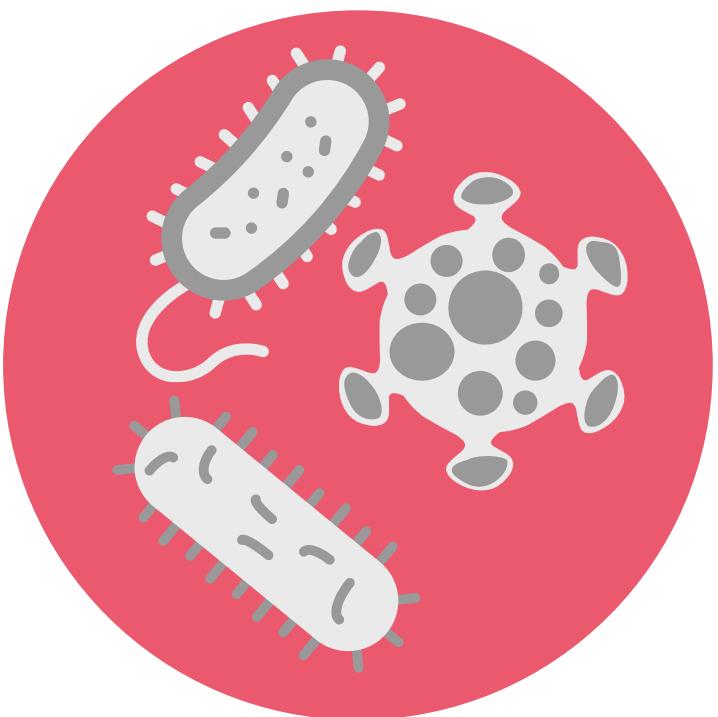
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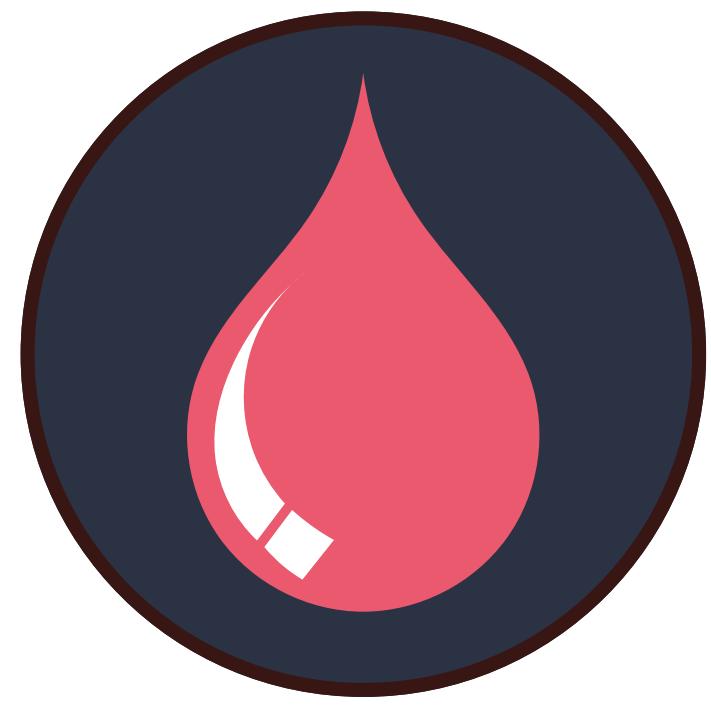
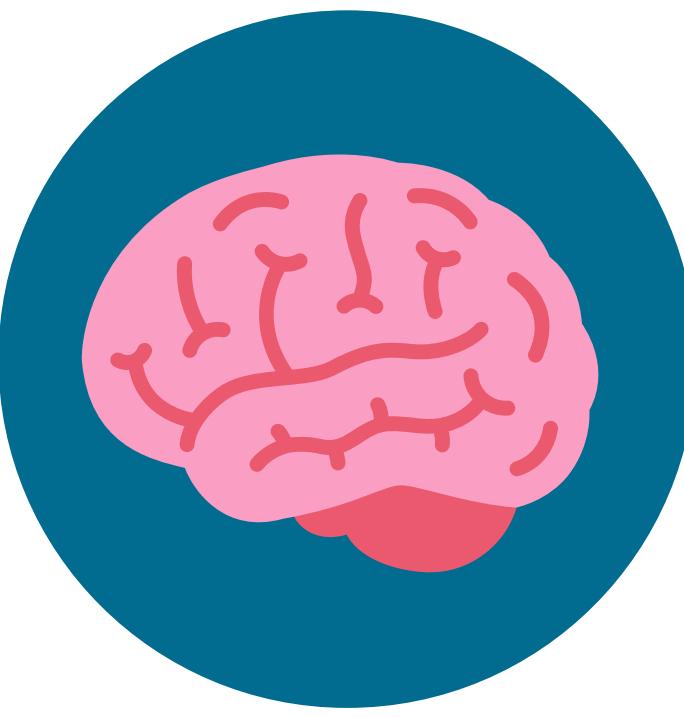
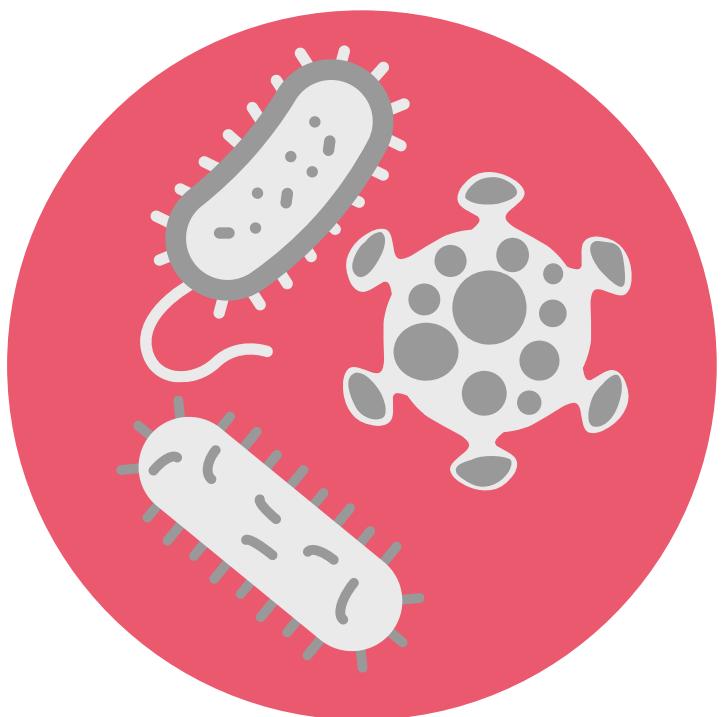
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Future Directions:

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Thank you

Mentors

Bridget Callaghan

Collaborators

BABLabs

Nim Tottenham

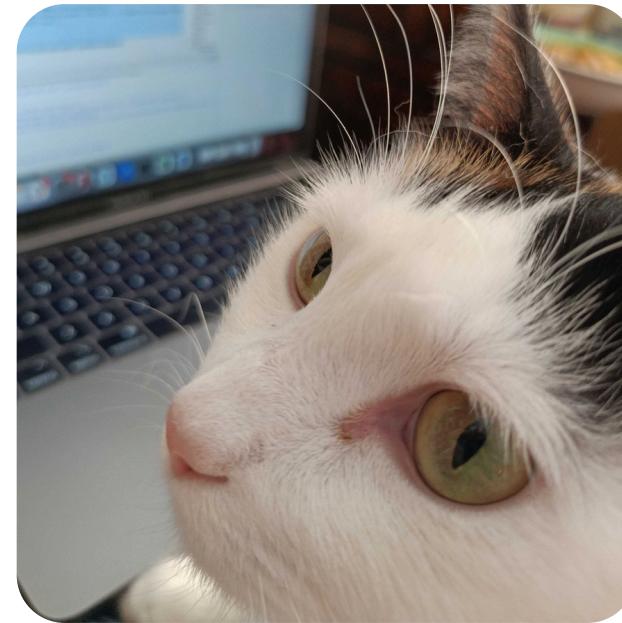
Funding Sources

NIMH

Goodman-Luskin

Microbiome Center

UCLA Grad Division



Link to slides



Participants & Families

Get in touch!

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