Recent advancement and the way forward

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The 24-hour paradigm – some clarifications



The conceptual framework in which we're interested in all 24-hour behaviours

- Measuring 24-hour behaviours
- Identifying determinants and profiles of 24-hour behaviours
- Assessing health effects of 24hour behaviours

Why are we interested in all 24hour behaviours?



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Why do we care about all 24-hour behaviours?

Increasing time in one behaviour means **decreasing** time in at least one other behaviour



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Why do we care about all 24-hour behaviours?

The impact on health of increasing one behaviour is **dependent** on where the time is taken from and how the remaining time is spent





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Compositional Data Analysis (CoDA)

How does it relate to the 24-hour framework?



This means that data convey *relative* information

Principle of CoDA is to "respect" this by expressing time-use as a **set of log-ratios**



Compositional Data Analysis (CoDA)

The basic steps

Step 1: define your composition



Step 2: Express the composition as a set of log-ratios

ilr2= <u>*</u>



Step 3: Use the log-ratios in your analysis

E.g. linear regression

BMI = i|r1 + i|r2 + i|r3



What has been done?

The 24-hour paradigm advancements

(Some selected methodology/editorial publications)





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2019

Hallman et al. (Int J Env Res Pub He) Calibrating self-reports based on CoDA

Gupta et al. (Int J Obes) Compositional latent profile analysis

McGregor et al. (EJPC) Compositional cox regression models



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2018

Gupta et al. (IJBNPA) Comparison of standard vs. CoDA method



WARK WARK

LIPA

Sedentary

behaviors

stand

THE

WIRA

11B

-0.5

-1.0

Sedenary Stand





2020

Dumuid et al. (J Bone Miner res) Optimal day of 24-hour (children)

del Pozo Cruz et al. (Am J Epidemiol)

Compositional cluster and survival analysis



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2020

Gupta et al. (Ann Work Expo Health) CoDA within occupational health

Dumuid et al. (Int J Environ Res Public Health) CoDA within public health

> Lund Rasmussen et al. (IJBNPA) Zero problems





2021

Dumuid et al. (Lancet) Healthy balance of daily behaviours

Holtermann et al. (Sports Medicine – Open) The "sweet-spot" hypothesis

Chastin et al. (J Phys Act Health)

Stricking the right balance



2022

What's next?



Is the North keeping up?

Publications within the 24-hour paradigm



Source: scopus.com



Search: ("compositional data analysis" OR "compositional data") AND ("physical activity" OR sedentary OR sitting OR sleep)

24-hour paradigm publications across the globe

Publications

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Source: scopus.com

Search: ("compositional data analysis" OR "compositional data") AND ("physical activity" OR sedentary OR sitting OR sleep)

24-hour paradigm publications across the globe



Source: scopus.com

Search: ("compositional data analysis" OR "compositional data") AND ("physical activity" OR sedentary OR sitting OR sleep)

Where does the North stand?



Source: scopus.com





Search: ("compositional data analysis" OR "compositional data") AND ("physical activity" OR sedentary OR sitting OR sleep)

Does the research have any impact?



Make your whole day matter.

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The Canadian 24-Hour Movement Guidelines for Adults (18-64 years) integrate recommendations for physical activity, sedentary behaviour and sleep. Following the guidelines can help you obtain health benefits and live your best life!

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WHO GUIDELINES ON PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR





or an equivalent combination throughout the week



Does the research have an impact?

Termonology used to describe guidelines

"[...] the new WHO guidelines point to the importance of attending to both physical activity and sedentary time to try to optimize the "balance" of these behaviours for better health."

Dempsey et al. Int J Behav Nutr Phys Act (2020)

"This paradigm shift away from a focus on a single movement behaviour to the integration of all movement behaviours reflects a growing body of evidence suggesting that the mixture of the movement behaviours that comprise a 24-hour day influences a range of health outcomes."

Ross et al. Applied Physiology, Nutrition, and Metabolism (2020)



Is there a call for more?

"Moreover, since sedentary time, light-intensity physical activity, MVPA and sleep all co-exist and interact within a finite 24-h day or energy total, analytical methods that better account for the relative time- and energy-use compositions of these behaviours will provide more useful insights into correlates and behavioural associations with health outcomes."

Dempsey et al. Int J Behav Nutr Phys Act (2020)

"Research needs arising from compositional analyses: longitudinal and intervention research, research further utilizing compositional data analysis statistical techniques to explore the associations between movement behaviours and a wider variety of health outcomes."

Ross et al. Applied Physiology, Nutrition, and Metabolism (2020)





Where to go from here?

04



Plenum discussion

Should our research focus on one behaviour in isolation or follow the 24-hour paradigm?

Does your current/future research projects align with the 24-hour paradigm?

Is CoDA is the best analytical approach to answer research questions related to the 24-hour paradigm?



THANK YOU

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