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Below is my review of the thesis authored by Zuzanna Laudanska entitled, "The development of motor and vocal coordination in infancy: dynamic systems approach". I outline some comments and suggestions for the author and their committee members to consider. To be clear, from my review, my conclusion is 'positive' and I conclude that Ms Zuzanna Laudanska' thesis entitled, "The development of motor and vocal coordination in infancy: dynamic systems approach" fulfills the requirement set in the Art. 187 of the Act of 20 July 2018 – Law on Higher Education and Science (Journal of Laws of 2023, item 742).

The overarching question of this thesis focuses on the developmental changes of motor-vocal coordination in infancy. Specifically, it asks how the increasing multimodal (motor-vocal) specialization to the demands of the task-driven context unfolds with infants' age. The author laid out research questions and specific predictions and were able to, throughout numerous chapters, answer these questions with appropriate analyses and tempered interpretations. Below, I delineate thoughts/suggestions/encouragements by thesis chapter.

Chapter 1:

1. Great overview! This is terrific scholarship.

Chapter 2:

1. No comments.

Chapter 3:

1. Although a control comparison was included with shuffled (matched) time series, a stronger control would have been to randomly pair unshuffled time series from different infants (e.g., left hand from infant 1 with right hand from infant 14), to get an understanding of the overall coherence of randomly-paired time series that still have similar task-specific properties.

Chapter 4:

1. Figure 4.4 y-axes should have consistent ranges.
2. Figure 4.5 should have y-axis labels.
3. A comment to consider: It would be good to think more critically about what 'reorganization' means. Does increased coupling correspond to the conceptual idea of a system 'reorganizing'? I could see this argument, but wouldn't it also be the case that a system with the same properties just get stronger in the coordination of these properties? To use a network example: a network with the same connecting nodes, could just strengthen in their connections and this would be associated with evidence of 'increased coupling'. With the same network example, a reorganization might be that different connections of nodes change over time (or after a perturbation event), but those

connections are just as strong as before with a different set of connecting nodes. Here, there is no change in coupling strength, but a drastic change in the organization of connections.

4. Yingling (1981) is brought up in the Discussion section and there is a discussion about posture and vocal production and that the author says these issues should be looked at in future work. Yes, please do this!

Chapter 5

1. Figure 5.2: Can you relabel the y-axis? It is hard to follow what this ratio is without more effort looking in the text.

Chapter 6

1. The result showing increased turn-taking during book reading is surprising. Could you think of more alternative explanations for this result? For example, when I read to my daughter, she sometimes tries to repeat the words that I am producing. Is this turn taking? One take-home point from Hilbrink et al.'s Frontiers special issue is the question of the functionality of turn taking. Is vocal turn-taking during book reading the same – functionally – compared to vocal turn-taking during other types of interactions like free flow play?

Discussion and overall thoughts

This thesis observed context dependent vocal-motor dynamics during the first year of life and showed how caregivers provide remarkable stability. There are a few points I'd like to bring up about the overall thesis and ideas for the future.

First, as I stated above, this thesis is an excellent scholarly product. I would encourage the author to consider reworking some of these ideas (specifically the unpublished chapters) into a larger publishable document like an SRCD monograph. As the author has documented in their review, many of these ideas have been discussed – in piecemeal – for decades, but this thesis provides an important synthesis that is a singular coherent product. I would encourage the author to 'swing for the fences' and think about how they could make the biggest impact with this important work.

Second, in the Discussion, the author considers Latash's work on motor abundance and synergies. I provided a previous comment about how the author is treating the concept of reorganization and coupling. I would encourage the author to think more deeply about the conceptual connections between motor abundance, synergies, coupling and reorganizations and also the empirical possibilities to add clarity to these issues. To me, this issue is a strength and a weakness of the thesis. It is a strength because the author is starting to make these conceptual connections. It is a weakness because there are still many important connections to make in order to create clear delineations between these concepts.

Third, and related to the second point here, in their book, Thelen and Smith discussed perturbations and how systems reorganize around them. A strong complex system can reorganize

quickly and these ideas are related to adaptiveness and also meta-stable systems. As Yingling (1981) showed, changing postures led to more mature vocalizations. What about changing postures, or to go further, changing anatomies and motor abilities, are special in terms of acting as perturbations on a system? Perhaps this is how we should measure the reorganization of systems like the vocal-motor system?

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