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Entangled histories, the two-state-vector and the pseudo-density formalisms: Towards a better understanding of quantum temporal correlations.

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The two-state-vector formalism, the entangled histories and the pseudo-density formalisms are attempts to better understand quantum correlations in time. These formalisms share some similarities, but they are not identical, having subtle differences in their interpretation and manipulation of quantum temporal structures [1, 2]. I will show, for instance, that they treat operators and states on equal footing, leading to the same statistics for all measurements. I will discuss the topic of quantum correlations in time and show how they can be generated and analysed in a consistent way using these formalisms. I will also elaborate on an unconventional behaviour of temporal monogamic structures and quantum histories of evolving multipartite systems which do not exhibit global nonlocal correlations in time but nevertheless can lead to entangled reduced histories characterizing evolution of an arbitrarily chosen subsystem.

[1] M. Nowakowski, E. Cohen, P. Horodecki, Entangled Histories vs. the Two-State-Vector Formalism - Towards a Better Understanding of Quantum Temporal Correlations, Phys. Rev. A 98, 032312 (2018).
[2] M. Nowakowski, Quantum Entanglement in Time, AIP Conference Proceedings 1841, 020007 (2017).

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