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What can we learn from the dynamics of entanglement and quantum discord in the Tavis-Cummings model?[1] JULIANA RESTREPO, Universidad Antonio Nario, BORIS A. RODRIGUEZ, Universidad de Antioquia — We revisit the problem of the dynamics of quantum correlations in the exact Tavis-Cummings model. We show that many of the dynamical features of quantum discord attributed to dissipation are already present in the exact framework and are due to the well known non-linearities in the model and to the choice of initial conditions. Through a comprehensive analysis, supported by explicit analytical calculations, we find that the dynamics of entanglement and quantum discord are far from being trivial or intuitive. In this context, we find states that are indistinguishable from the point of view of entanglement and distinguishable from the point of view of quantum discord, states where the two quantifiers give opposite information and states where they give roughly the same information about correlations at a certain time. Depending on the initial conditions, this model exhibits a fascinating range of phenomena that can be used for experimental purposes such as: Robust states against change of manifold or dissipation, tunable entanglement states and states with a counterintuitive sudden birth as the number of photons increase. We furthermore propose an experiment called quantum discord gates where discord is zero or non-zero depending on the number of photons.

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