We study the linear instability of solitary wave solutions to the nonlinear Dirac equation (known to physicists as the Soler model). That is, we linearize the equation at a solitary wave and examine the presence of eigenvalues with positive real part.

We show that the linear instability of the small amplitude solitary waves is described by the Vakhitov-Kolokolov stability criterion which was obtained in the context of the nonlinear Schroedinger equation: small solitary waves are linearly unstable in dimensions 3, and generically linearly stable in 1D.

A particular question is on the possibility of bifurcations of eigenvalues from the continuous spectrum; we address it using the limiting absorption principle and the Hardy-type estimates.

The method is applicable to other systems, such as the Dirac-Maxwell system.

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