This paper deals with a novel generalization of classical blind source separation (BSS) in two directions. First, relaxing the constraint that the latent sources must be statistically independent. This generalization is well-known and sometimes termed independent subspace analysis (ISA). Second, jointly analyzing several ISA problems, where the link is due to statistical dependence among corresponding sources in different mixtures. When the data are one-dimensional, i.e., multiple classical BSS problems, this model, known as independent vector analysis (IVA), has already been studied. In this paper, we combine IVA with ISA and term this new model joint independent subspace analysis (JISA). We provide full performance analysis of JISA, including closed-form expressions for minimal mean square error (MSE), Fisher information and Cramér-Rao lower bound, in the separation of Gaussian data. The derived MSE applies also for non-Gaussian data, when only second-order statistics are used. We generalize previously known results on IVA, including its ability to uniquely resolve instantaneous mixtures of real Gaussian stationary data, and having the same arbitrary permutation at all mixtures. Numerical experiments validate our theoretical results and show the gain with respect to two competing approaches that either use a finer block partition or a different norm.