On the error bound in a combinatorial central limit theorem

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The notion of exchangeable pair is central to Stein’s method. The use of concentration inequalities is an effective means for bounding the Kolmogorov distance in normal approximation. Let \{X_{ij}: i, j = 1, ..., n\} be independent random variables with finite 3rd moments and let \(\pi\) be a random permutation of \((1, ..., n)\), independent of the X_{ij}. Let \(U = \sum X_i \pi(i)\) and let \(W = (U - EU)/(\text{Var}(U))^{\frac{1}{2}}\). In this talk we will use exchangeable pairs and the concentration inequality approach to obtain a 3rd-moment error bound on \(|P(W \leq x) - \Phi(x)|\), where \(\Phi\) is the standard normal distribution function. This result includes the case where the X_{ij} are constants and the case of sampling without replacement from independent random variables. A self-normalized version of the problem will also be discussed. This talk is based on joint work with Xiao Fang.