Improving estimates for discrete polynomial averaging operators

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It as a well-known property of all averaging-type operators that their operator norms are at most 1, simply as a consequence of the triangle inequality. In general, constant 1 cannot be improved, even when one considers various $L^p \to L^q$ estimates for $p \neq q$. However, certain averaging operators allow a significant improvement of this constant, which finds applications to various problems in the harmonic analysis. Here we study averaging operators in a discrete polynomial setting, and prove sharp improving $\ell^p \to \ell^q$ estimates in a close-to-optimal range of exponents (p, q). This is joint work with R. Han, M. T. Lacey, F. Yang (Georgia Institute of Technology), and J. Madrid (University of California, Los Angeles).