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**A combinatorial approach to the  $q, t$ -symmetry relation in Macdonald polynomials.** (English)

Zbl 1337.05109

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Summary: Using the combinatorial formula for the transformed Macdonald polynomials of *J. Haglund* et al. [J. Am. Math. Soc. 18, No. 3, 735–761 (2005; Zbl 1061.05101)], we investigate the combinatorics of the symmetry relation  $\tilde{H}_\mu(\mathbf{x}; q, t) = \tilde{H}_{\mu^*}(\mathbf{x}; t, q)$ . We provide a purely combinatorial proof of the relation in the case of Hall-Littlewood polynomials ( $q = 0$ ) when  $\mu$  is a partition with at most three rows, and for the coefficients of the square-free monomials in  $\mathbf{x}$  for all shapes  $\mu$ . We also provide a proof for the full relation in the case when  $\mu$  is a hook shape, and for all shapes at the specialization  $t = 1$ . Our work in the Hall-Littlewood case reveals a new recursive structure for the cocharge statistic on words.

**MSC:**

05E10 Combinatorial aspects of representation theory

05E05 Symmetric functions and generalizations

33D52 Basic orthogonal polynomials and functions associated with root systems  
(Macdonald polynomials, etc.)

Cited in 1 Document

**Keywords:**

Macdonald polynomials; Hall-Littlewood polynomials; Young tableaux; cocharge; Garsia-Procesi modules; Mahonian statistics

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