Social-emotional comprehension, defined as the ability to encode, interpret, and reason about social-emotional information and to control behavior and emotions, is an important predictor of social behavior and other important outcomes. This paper presents results from two studies that included ethnically and socioeconomically diverse samples totaling 4,462 children in kindergarten through third grade. Each study examined the psychometric properties of a web-based, self-administered battery of performance assessments of social-emotional comprehension. Assessment modules measured children's ability to read facial expressions, infer others' mental states, solve social problems, delay gratification, and tolerate frustration. Lessons learned from Study 1 were applied to a slightly revised version of the assessment module, which was used in Study 2. Both studies provided evidence that: (a) individual assessment modules exhibited moderate to high internal consistency and low to moderate test-retest reliability, (b) composite assessment scores exhibited high reliability, (c) together, assessments demonstrated a theoretically coherent factor structure, (d) assessments demonstrated convergent and discriminant validity, and (e) performance on the assessments was positively related to teacher report of social skill and multiple indicators of academic achievement, and negatively related to teacher report of problem behaviors.