In this paper, we aim at analyzing the use of dynamics in jazz improvisation by applying score-informed source separation and automatic estimation of note intensities. A set of 120 jazz solos taken from the Weimar Jazz Database covering many different jazz styles was manually transcribed and annotated by musicology and jazz students within the Jazzomat Research Project. In order to enrich these symbolic parameters with note-wise intensity annotations, the solo instrument tracks are extracted from the original audio files by applying a pitch-informed separation algorithm that uses the manual transcriptions as prior information. Subsequently, the magnitude envelope and spectral energy are analyzed in order to extract intensity measures for all note events in the solo. Next, we investigate how dynamics are used as a stylistic tool in jazz improvisation. To this end, we analyze how the note intensity values correlate with contextual information encoded in the note’s pitch, duration, position within a musical phrase, perceptual accents, and structural markers. Additionally, we compare the use of dynamics among different instruments (alto and tenor saxophone, trumpet, and trombone). The results of this interdisciplinary study have implications for jazz research, jazz education, performance research, as well as for Music Information Retrieval fields such as automatic music transcription and source separation.