Recent research showed that good overnight sleep after learning helps adult second-language (L2) learners consolidate newly learned sounds (segments), that is, an effect of overnight consolidation. Since lexical tone is characterized by high variability across talkers, the overnight consolidation might also facilitate L2 learners’ generalization across talkers in their identification of novel tonal categories. Thus, this study examined whether the overnight consolidation facilitated talker-independent learning of Cantonese level tones by Mandarin listeners. Two level-tone training experiments were conducted to investigate research questions as follows: (1) whether the listeners who were perceptually trained in the evening and got their newly learned tones consolidated right after training had an advantage over those who were trained in the morning; (2) whether a high-(talker) variability training, together with a post-training consolidation, facilitated the evening trainees’ tone learning compared with a low-variability training. The results of identification changes over time suggest that the overnight consolidation have assisted the evening trainees’ learning of tone stimuli produced by the trained and novel talkers, but an exposure to talker variability during training disrupted the consolidation process. The findings have implications for understanding the mechanism of speech learning and human plasticity.