Effective empathy training interventions based on scientific evidence becomes essential. A theoretical framework should guide the proposed interventions and be coherent with the evaluation of the dimensions taking in account that empathy is currently a multidimensional concept. The study aimed to determine, for nursing students, what is the effectiveness of experiential versus humanistic training, in terms of improvement of empathic ability (dimensions) and maintenance over time of what has been learned, and to establish the degree of coherence between the proposed theoretical model and the trained and evaluated dimensions. A systematic review using six databases was performed. The data were synthesised, and the risk of bias was analysed using the Equator Guidelines. Nine articles were selected. Further evidence of the effectiveness of experiential intervention against humanistic educational strategies was observed. Most studies were not based on a solid theoretical framework and, in these cases, inconsistency between empathic trained dimensions and those evaluated was detected. Although a better understanding of training time variable is required, middle-term interventions are recommended. Increasing the multicentre controlled trials; specifying the intervention that includes the empathy dimensions; triangulating the data from health professionals, patients, and external observers; and including monitoring, becomes a necessity.