Interactive Virtual Humans (VHs) are increasingly used to replace or assist real humans in various applications, e.g., military and medical training, education, or entertainment. In most VH research, the perceived social presence with a VH, which denotes the user’s sense of being socially connected or co-located with the VH, is the decisive factor in evaluating the social influence of the VH—a phenomenon where human users' emotions, opinions, or behaviors are affected by the VH. The purpose of this dissertation is to develop new knowledge about how characteristics and behaviors of a VH in a Mixed Reality (MR) environment can affect the perception of and resulting behavior with the VH, and to find effective and efficient ways to improve the quality and performance of social interactions with VHs. Important issues and challenges in real-virtual human interactions in MR, e.g., lack of physical-virtual interactivity, are identified and discussed through several user studies incorporating interactions with VH systems. In the studies, different features of VHs are prototyped and evaluated, such as a VH's ability to be aware of and influence the surrounding physical environment, while measuring objective behavioral data as well as collecting subjective responses from the participants. The results from the studies support the idea that the VH's awareness and influence of the physical environment can improve not only the perceived social presence with the VH, but also the trustworthiness of the VH within a social context. The findings will contribute towards designing more influential VHs that can benefit a wide range of simulation and training applications for which a high level of social realism is important, and that can be more easily incorporated into our daily lives as social companions, providing reliable relationships and convenience in assisting with daily tasks.