Objectives: A clinically validated robot toothbrushing programme was developed for rapid, reproducible laboratory testing of tooth cleaning (Lang et al. JDR 89 Spec. Iss. B, 2514). It was, therefore, the aim to supplement the robot test of manual and powered toothbrushes on artificial teeth arranged in adult or mixed dentitions with a computer-assisted photographic documentation system of percentage of plaque removal in 24 planimetrical fields per tooth crown and 4 fields per root.

Methods: Seven manual toothbrushes (2 soft, 3 interdental cut and 2 kids/junior brushes) underwent horizontal, vertical and rotating brushing movements orally and buccally of teeth 32 – 48. Each run was repeated 5 times. After brushing away the plaque simulating substrate on all teeth, they were transferred to the assessment equipment. The 10 teeth were computer-assisted rotated, so each of the 4 sites was photographed and the percentage of plaque-free area per planimetrical field was assessed. These measurements were repeated 3 times. The plaque assessment programme allows differentiation into 4 surfaces, risk areas like gum line or proximal fields and roots etc. per single tooth or per group of teeth/all teeth. All data underwent statistical analysis (F-test, Kruskal-Wallis test, t-test).

Results: The plaque removal efficacy of 7 brushes on buccal sites (9 fields) ranged from 37.6% to 83.1%, on oral sites in 9 fields (55.6% - 82.7%), on proximal sites in 3 fields (17.9% - 36.7%) and on in-between surfaces in 5 fields (16.8% - 37.1%). The risk areas next to gum line and proximal fields (ABCDF) exhibited buccally plaque removal efficacy from 19.0% to 59.8% and lingually from 42.5% to 53.1%. Test toothbrushes of different design exhibited extremely and significantly different plaque removal efficacy.

Conclusions: The planimetrical plaque assessment programme is reproducible and demonstrates the efficacy of test toothbrushes in all planimetrical fields or in any possible combination of fields per tooth, per group or per quadrant of dentition. Robot tested toothbrushing using any brushing technique or any manual or powered toothbrush, supplemented with the computer-assisted planimetrical plaque assessment is a recommended research tool for developing new prototypes and comparisons with reference brushes. Supported by M+C Schiffer, Neustadt-Wied, Germany.