



Investigating the Bond Strength of Denture Bases: A Comparison of Pick-Up Materials and Fabrication Methods

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Objectives

The aim of this study is to determine the bond strength of non-splinted attachment pickup materials to 3D-printed, milled and conventionally fabricated denture base materials.

Materials & Methods

Denture Base Fabrication

- Standardized 10x10x5mm Blocks:
 - Heat-Polymerized PMMA (Lucitone 199;Dentsply Sirona)
 - Milled Pre-Polymerized PMMA (Lucitone 199;Dentsply Sirona)
 - 3D-Printed Denture Base (Lucitone Digital Print;Dentsply Sirona)

Pick-Up Materials

- Three pick-up materials were used to bond two blocks of the same manufacturing mode together and were used as instructed:
 - Composite resin with a proprietary bonding agent (Quick Up; VOCO)
 - Composite resin without bonding agent (Chairside; ZEST Dental)
 - Acrylic resin used without any adhesive (Duralay; Reliance Dental Manufacturing).

Sample Fabrication

Each pick up material was dispensed onto the surface of the block, reaching a controlled amount of 2 mm uniformly along the surface, onto which the second block was bonded to

Sample Sectioning

All the samples were serially sectioned into both “X” and “Y” directions by a diamond saw to produce several bonded beams of approximately 2mm² of cross-sectional area.

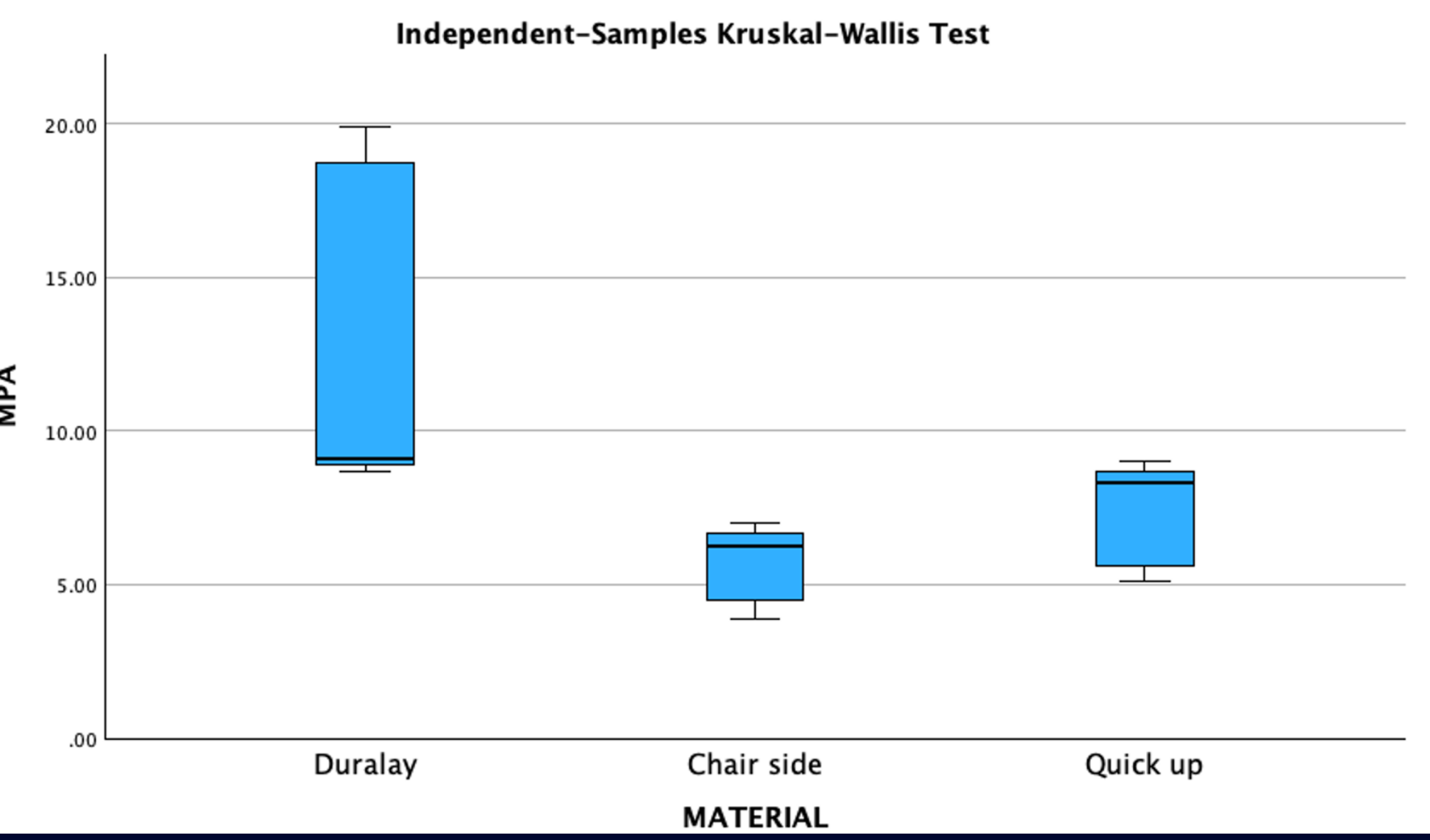
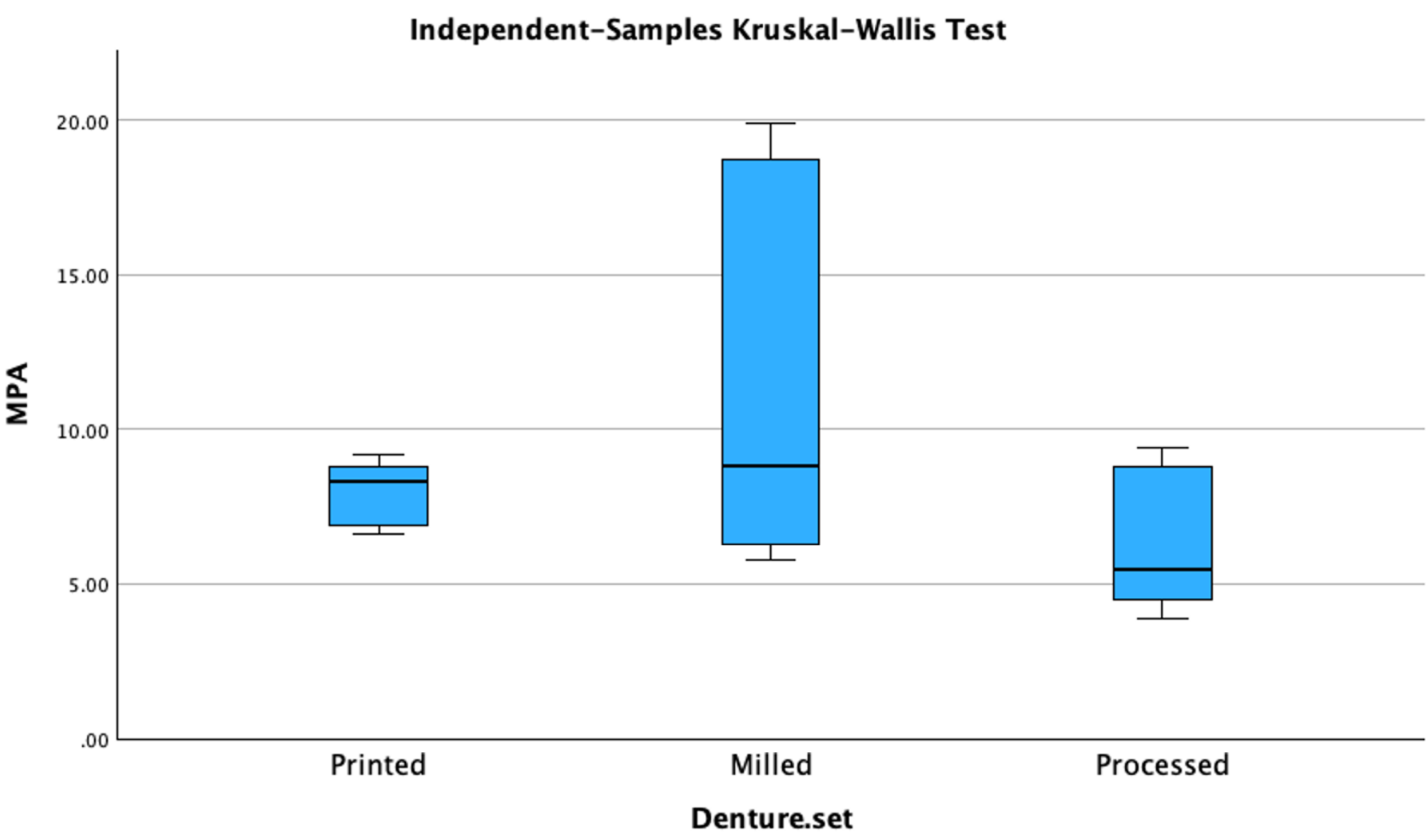
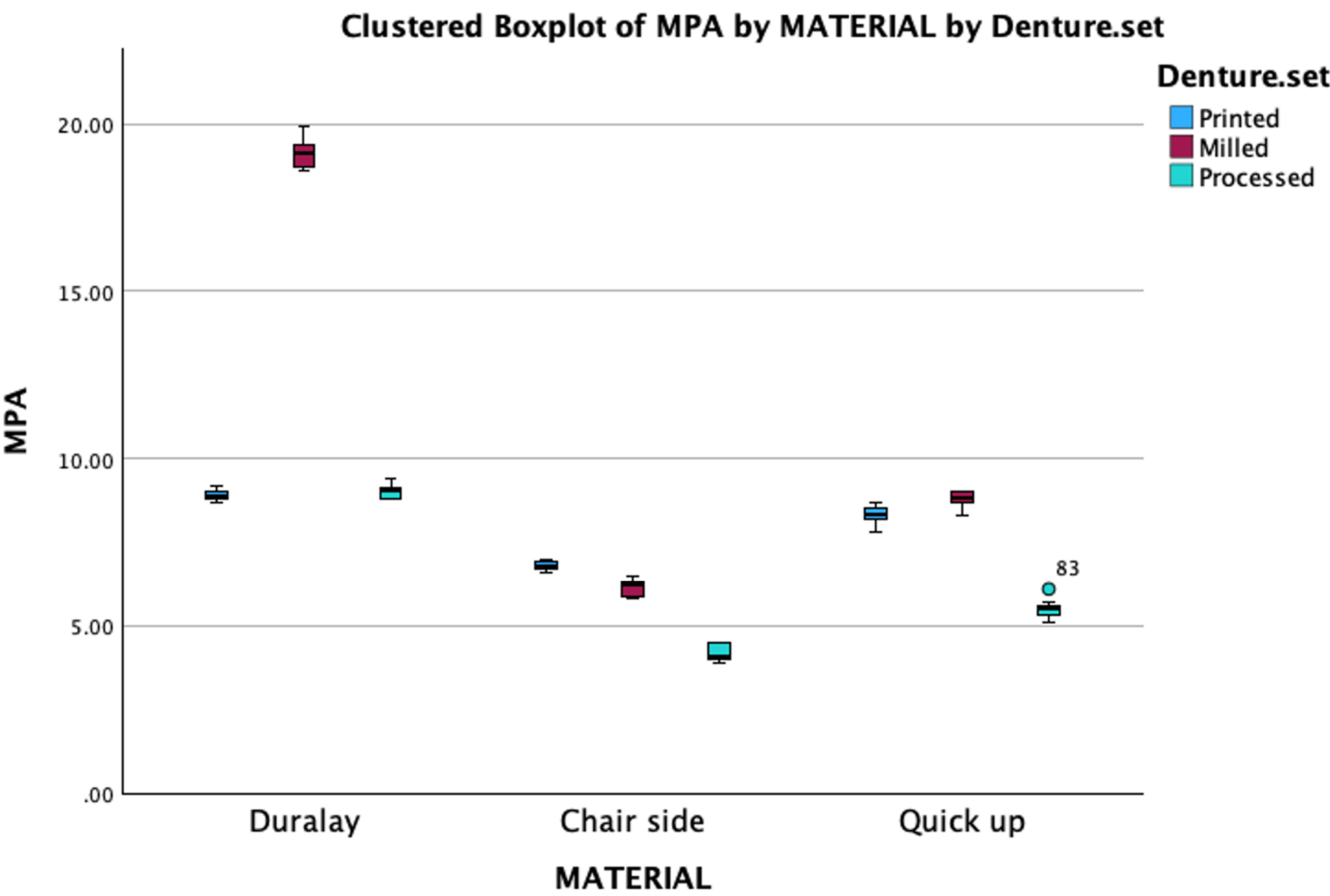
Micro-Tensile Testing

Each beam was then be subjected to a micro-tensile test using a universal testing machine at a crosshead speed of 1mm/minute.



Results

Milled denture base resin exhibited significantly higher bond strength values than printed and processed materials ($P<.0001$), with printed materials showing significantly higher bond strength than processed materials ($P<.0001$). Among the pick-up materials, Duralay demonstrated significantly the highest bond strength, followed up Quick-Up and Chairside ($P<.0001$). The highest bond strength was observed in the combination of milled denture base and Duralay ($P<.0001$). Significant interaction between the base and pick-up materials was also found ($P<.0001$), indicating that the bond strength was influenced by both individual material properties and their combinations.



Conclusion

The acrylic resin pick-up material (Duralay; Reliance Dental Manufacturing) showed the highest bond strength values across all groups, particularly when bonded to the milled denture base resin. This combination demonstrated superior performance compared with other tested materials, including composite resin with bonding agent (Quick Up) and without bonding agent (Chairside), across printed, milled, and conventionally processed denture bases.

References

