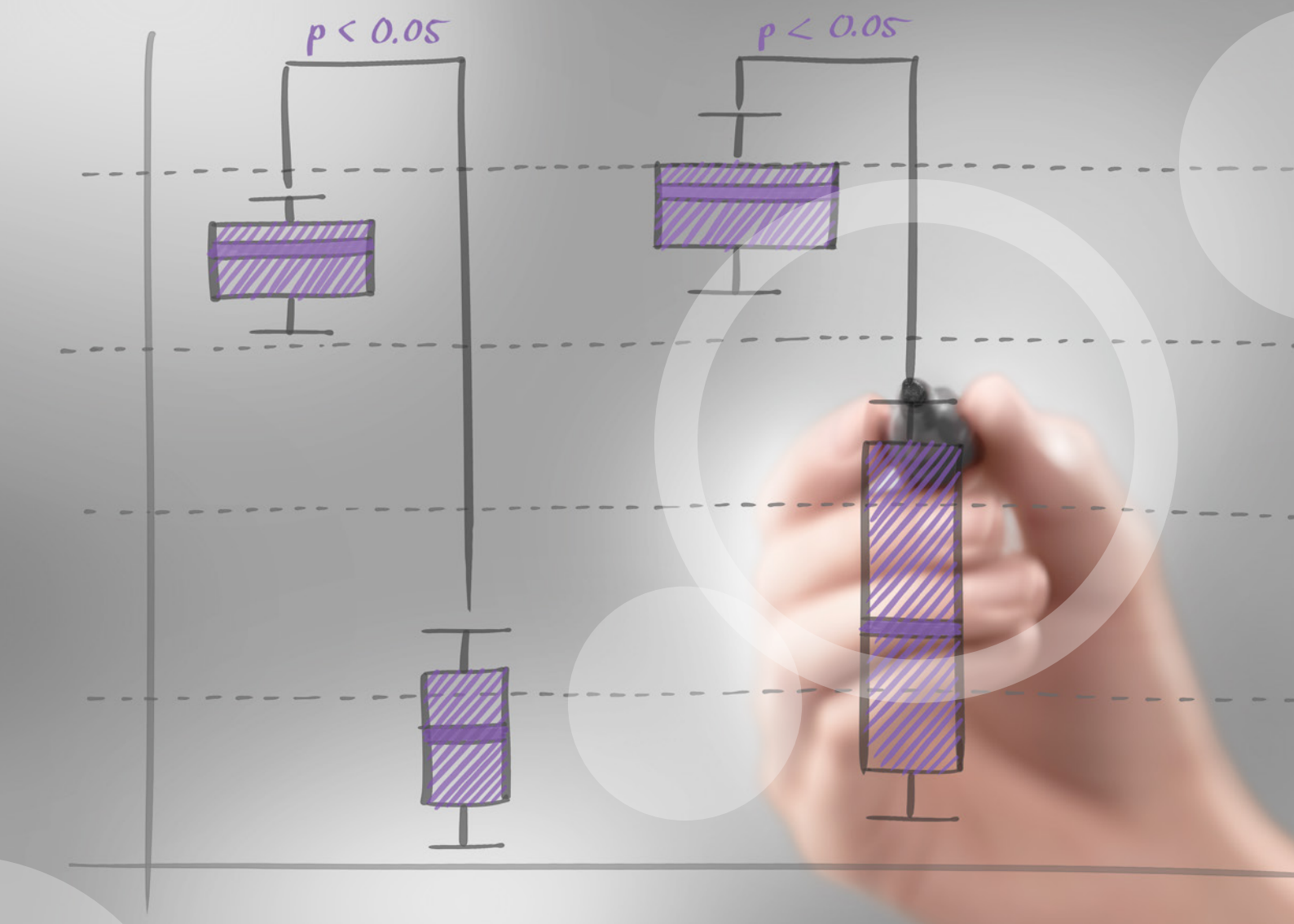
dima®
Scientific Information



dima Print Mouth Guard

3D printable sports mouth guard material – Nippon Dental University and Mitsui Chemicals, Japan
New photopolymer for additive manufacturing with impact absorbable feature – Impact absorption properties

The importance of protective mouth guards to avoid traumatic dental and orofacial injury in contact sports cannot be stressed enough and has been confirmed in several studies[1]. However, the manufacturing of properly fitted, custom-made mouth guards by deep drawing can be very labour-intensive especially concerning occlusal adjustment. Compared to the conventional method using thermoplastic film, the newly developed dima Print Mouth Guard is formed by 3D printer, allowing the shape, thickness, and occlusal adjustment to be custom-designed to meet the various needs of each athlete. The following data demonstrates that dima Print Mouth Guard has excellent shock absorbing qualities, which indicates a reduced traumatic impact on the teeth and optimal protection for the athlete.

Giving a hand to oral health.

KULZER
MITSUI CHEMICALS GROUP

[1] Maeda Y *et al.* Effectiveness and fabrication of mouthguards. Dent Traumatol. 2009 Dec;25(6):556-64

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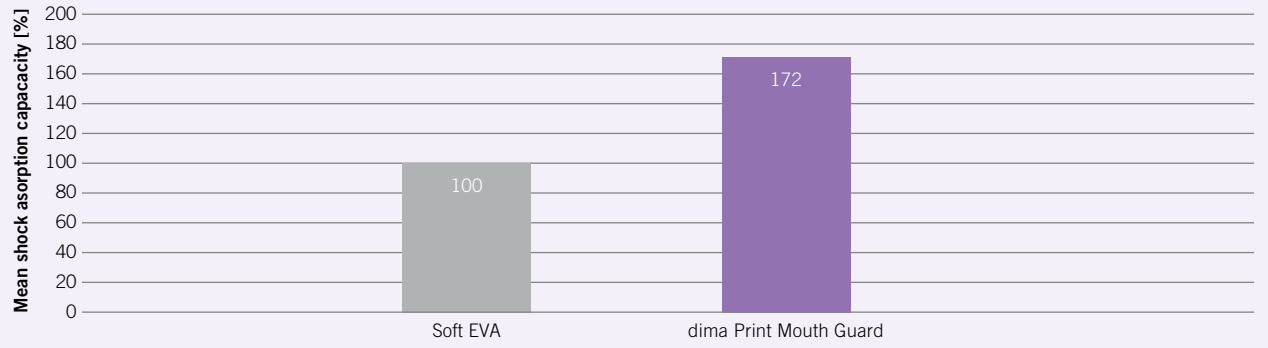
Objective
The aim of this study was to assess the impact absorption capabilities of the new photopolymer dima Print Mouth Guard (Kulzer) in comparison to an EVA sheet conventionally used in mouthguard manufacturing by deep drawing.

Materials and Methods
Using a 3D printer (cara Print 4.0, Kulzer), dima Print Mouth Guard was photopolymerized to fabricate a 3 mm thick film. An ethylene-vinyl acetate copolymer (Soft EVA, Key Stone) with a thickness of 3 mm was used as the control material. The shock absorption qualities were measured using a drop impact test. A small load cell for both tension and compression (LMU 200N) was installed at the bottom of the apparatus, and a zirconia plate (thickness: 1 mm) was placed on top of it. A material sample with a thickness of 3 mm was fixed on top of the zirconia plate. To simulate conditions in the oral cavity, the specimen was immersed in a thermostatic bath (37 °C) before testing. The test was conducted in a thermostatic chamber at 23 °C. The load cell was connected to a "ZT Digital Force Gauge" to measure the maximum impact force during the test. For the drop test, an iron ball weighing 17.9 g and 10 mm in diameter was dropped freely from a height of 50 cm (n = 5) to the center of the load cell. The impact force was measured, and the value subtracted from the impact force when the ball was dropped directly onto the zirconia plate of the testing machine (control value). The difference was evaluated as the shock absorption capacity.

Results
dima Print Mouth Guard exhibits excellent shock absorbing capability



Conclusion
dima Print Mouth Guard exhibited a high shock absorption capacity about 1.7 times larger than the control material.

Comment
These results suggest the use of dima Print Mouth Guard photopolymer resin to easily fabricate mouth guards and splints with excellent shock-absorbing properties using a 3D printer.

Source
Ohkuma K *et al.* New photopolymer for additive manufacturing with impact absorbable feature – Impact absorption properties. The Japanese Society for Dental materials and Devices. April 2020:P-18.

The study was abbreviated, summarised and commented and all diagrams and titles have been established by Kulzer. The Kulzer product mentioned in this study is chemically equivalent to the originally tested Mitsui Chemicals products.

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