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3D Printed Sports Mouthguard

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3D Printed Sports Mouthguard

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Background

- Integration of the modern technological advance of the three-dimensional (3D) digital printer with the sports-oriented mouthguard enables formulation of the product without the costly effect of conventional development processes and cuts wait time for customers.

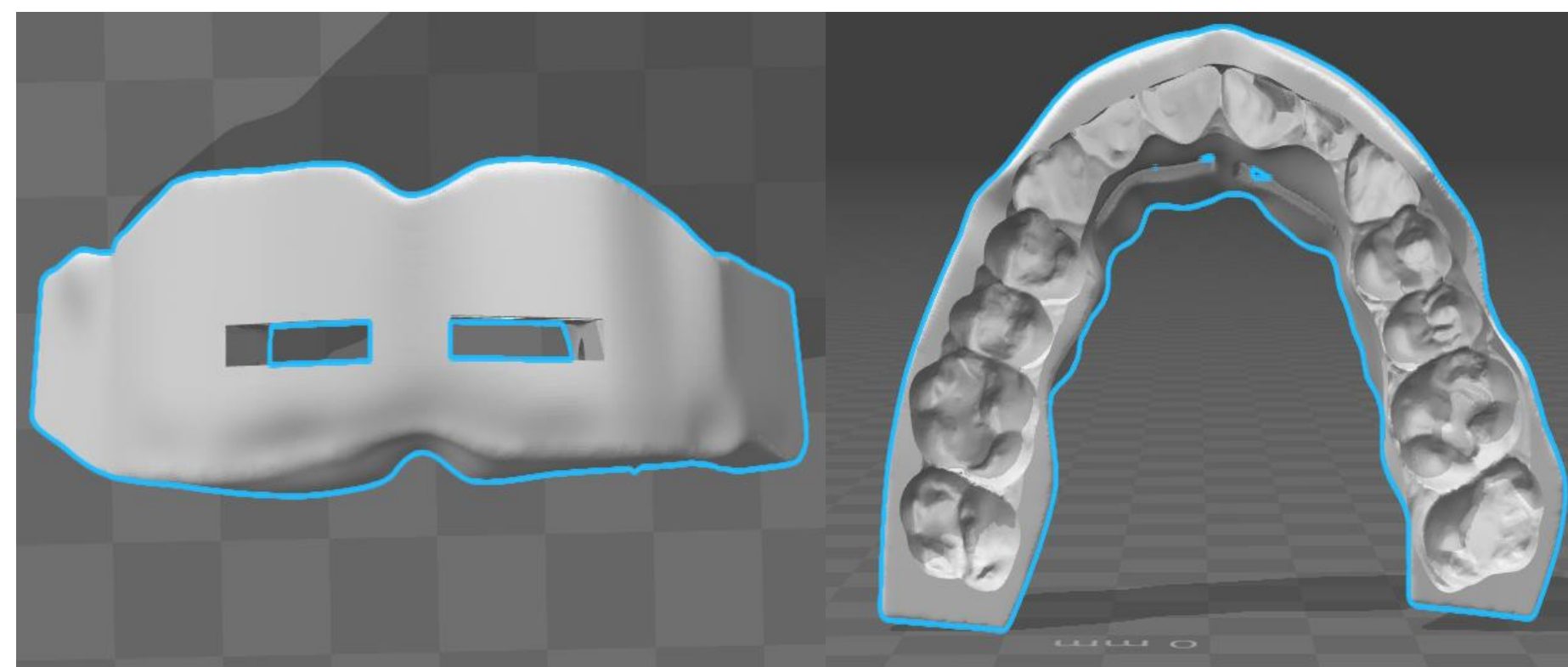


Fig. 1. C.A.D. program mouthguard [1]

- To produce a successful mouthguard which can absorb forces of impact for mouth area protection, the materials used must be rubber-like in nature and must comply with governmental regulations of the American Dental Association (A.D.A.) and the Food and Drug Administration (F.D.A.). Additionally, the 3D printed device must provide comfort by enabling the user to breathe, speak, and perform exceptionally and without irritation.

How is this possible?

- The process by which mouthguards can be customized for comfort and performance begins with oral scanning so that the mouthguard can fit perfectly inside the user's mouth.
- Next, the scan is immediately saved as a Standard Triangle Language (.STL) file extension creating the 3D image which is deciphered on a computer-aided design (C.A.D.) software by the 3D printer so the formulation of the mouthguard can begin forming literally one layer at a time.
- 3D printer settings can be artistically customized to change the color and add special designs such as logos onto the mouthguard.



Fig. 2. 3D Printed Teeth Cast

Necessary Materials

Material Requirements

- Non-cytotoxic
- Non-oral irritant
- Non-skin sensitizer
- Bisphenol-A (B.P.A.) Free
- Polyjet, acrylic resin
- Photosensitive polymer liquid

Types of printers

Fused Filament Fabrication (F.F.F.):

- Fast printing
- Low quality outcome
- Inexpensive

Stereolithography (S.L.A.):

- Slow printing
- High quality outcome
- Expensive



Fig. 3. Color Design Option



Fig. 4. Polyjet Objet Eden260VS [2]

Community Learning

The 3D mouthguard accommodates to athlete's demands by significantly cutting time and cost in the effort to obtain an exceptionally safe, comfortable, and customizable oral protective device. According to a trusted 3D printing webpage called, "All About 3D Printing" (ALL3DP.com), a consumer can expect to receive the 3D mouthguard a week sooner than the traditional mouthguard and save more than 5% of the cost.

Traditional v.s 3D Mouthguards

Traditional

Stock (in store):

- Breathing and talking difficult, bulky, little protection
- Extremely low comfort and fit

Boil and Bite (in store):

- thermoplastic material which is heated and then placed in the mouth
- Slightly improved comfort and fit

Custom-fitted (dentist's office):

- Expensive due to molding cast, material, and time
- Higher comfort and fit

3D Printed

- Simple, quick mouth scan at dentist's office
- Received in about five business days
- Perfect comfort and fit

References

[1] <https://grabcad.com/library/digital-anti-snoring-mouthguard-sleep-splint-1>

[2] <http://www.egr.vcu.edu/about/facilities/mne-innovation-lab/equipment/>

<https://all3dp.com/best-resin-dlp-sla-3d-printer-stereolithography/>

