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Temporomandibular disorders in scuba divers: a systematic review

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ABSTRACT

Introduction: The number of divers has grown a lot in recent years [1]. The characteristics of the equipment that the divers use in the oral cavity to be able to breathe during the immersion are susceptible to provoke temporomandibular disorders (TMDs) [2]. These patients have specific characteristics related to difficulties in the temporomandibular joint (TMJ), in the masticatory muscles and tissues of the oral cavity. All these complaints are known as "Diver's Mouth Syndrome" [3]. The objective of this study was to obtain what's known about TMDs in scuba diving.

Materials and methods: Pubmed, cochcrane and B-on were used with the keywords "Temporomandibular Disorders" Mesh Term, AND/OR "Scuba Divers". Studies published in Portuguese, Spanish and English between 2018-1998 on humans were included. We included all clinical trials.

Results: We found 6543 citations of which 2238 duplications were excluded. After screening based on title and abstract analysis, we arrive on 62 full-text articles to assess and selected 8 studies. In terms of study characteristics they can be divided in TMD caused by lack of experience or lack of training in scuba diving [3]; history of TMD previous to scuba diving [4,5]; temperature of the water and facial pain [5]; and TMD and design, material and universal or customised mouthpiece (MP) and TMD [5–8].

Discussion and conclusions: Diving in colder waters is related with an increase in facial pain due to muscle contraction and clenching of masticatory muscles thus inducing facial pain [5]. In terms of TMD and MP for oxygen bottles the major part of the studies reveal the more customised the MP the less prone to TMD the subject is, so we have the standard MP, less efficient assuming that the same measure is for all mouths; the temperature mouldable MP to the mouth after being softened in hot water which deform with ease and the customised MP that are more effective, more expensive and constructed in the likeness of each one by the dentists so recognised by the sleep society [5].

Inexperienced divers tend to be more prone to TMD due to the mistake they make and stress they are exposed to. Due to the study design being so weak until now more studies should be carried out on the clinical side in a standardised way so that studies can be compared rather than based only on self-report.

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3D-Printing of zirconia dental prostheses

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ABSTRACT

Introduction: Yittria-stabilised-zirconia is a biomaterial widely employed in the production of dental prostheses through several traditional manufacturing and shaping processes (such as machining and surface grinding of a green or sintered block, gel-casting and injection moulding) which carry relatively high labour, tooling, moulding and waste material costs. Additive manufacturing 3D-printing processes, such as robocasting, enable the quick production of customised and intricate parts without the need for costly milling tools and moulds [1,2]. In this work, the robocasting process was employed in the production of zirconia parts using a layer-by-layer deposition strategy of a dispersed ceramic powder slurry through a numerically controlled extruder and nozzle. The highest possible solid content allowing for proper extrusion through a fine nozzle was determined for a plain, inexpensive water-based slurry of zirconia powders and dispersing agent.

Materials and methods: A commercial open-source 3D printer was modified to use a standard micrometric syringe and needle as an extruder Figure 1. An initial batch of 80 wt.% solid zirconia powder slurry was produced using a predetermined optimal CE64 dispersant ratio and equal portions were subsequently condensed through air-drying at 50 °C until an 82, 84, 86, 88 or 90 wt.% solid content ratio was reached. Each slurry was then used for the robocasting of zirconia cuboid samples, which were air-dried for 48 h at 50 °C and sintered at 1500 °C for 2 h. Sintered sample densities were measured using the Archimedes method and the polished base sample surfaces were characterised through microscopy analysis, hardness and toughness tests. The slurry yielding the best results was, thus selected for the production of a sintered tooth prototype using the same sample extrusion speeds, nozzle travel speeds and diameter (0.45 mm).

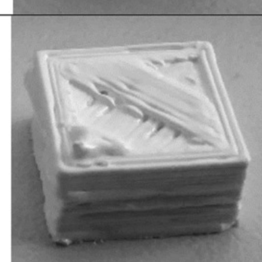
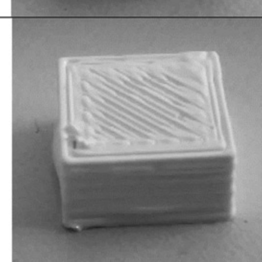
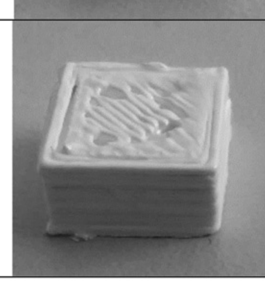
Slurry solid contents (%)	Printed green sample
84	
86	
88	
90	

Figure 1. Visual comparison of green samples robocasted from printable pastes.

Figure 2. Post-sintering public domain molar tooth prototype printed using the using the 88 wt.% solid slurry next to an unrelated extracted tooth for comparison. The sliced 3D prototype tooth model used is shown in the rightmost picture.

Results: The best sample print quality was attained using 88 wt.% solid content slurries, which resulted in minimal microscopic sintering defects and no extrusion faults due to transient clogging of the extrusion nozzle, thus reaching a sintered density 97% that of theoretical. A full-size tooth prototype was successfully fabricated using the 88 wt.% solid content slurries Figure 2.
Discussion and conclusions: The 88 wt.% solid content slurry showed increased viscosity, consistently raising extrusion pressure and shear stresses which likely broke-up any soft agglomerates, thus avoiding temporary nozzle clogging and the formation of agglomerate-related sintering defects. The 90 wt.% slurry showed near-dilatant behaviour, possibly possessing harder agglomerates. Thus, sintered sample parts with 97% theoretical density were realised from an 88 wt.% plain water-based slurry with no binders or plasticisers that would otherwise require an additional pre-sintering burnout stage and likely generate sintering defects.

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Association between mouth-breathing and atypical swallowing in young orthodontic patients at Egas Moniz Dental Clinic

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ABSTRACT
Introduction: Breathing and swallowing are functions of the stomatognathic system, since they are vital and innate to the human being, moreover, interrelated [1,2]. Most of the breathing is nasal, however mouth-breathing can occur, being a pathological adaptation that can lead to a series of changes, often irreversible, in the growth and development of a child, for instance causing changes in swallowing [3]. This mechanism differs between children and adults and, if identified in a child, up to five years, it is considered as infantile deglutition pattern being replaced by mature deglutition pattern after this period [4]. If it continues beyond the period in which it is considered normal, it is renamed as atypical [5]. Therefore, the aim of this study was to explore the possible relation between mouth-breathing and atypical swallowing in children.
Materials and methods: The study took place between January 2018 to February 2019, involving patients referred to the Care Consultation of Orthodontics Egas Moniz Dental Clinic (EMDC). The sample consisted of 86 patients, that $n = 46$ (53.4%) were females and $n = 40$ (46.6%) were males, with a mean age of 12.3 years. The study was approved by an