

President's Academic Showcase Tier 1 Finalists Abstracts

Effects Of Storage Techniques On Otoliths By Examining FT-IR Spectroscopy

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Faculty Mentor: Dr. Sean Bignami

Technological advances in the past decade have allowed researchers to study the microstructure of Calcium Carbonate (CaCO₃) otoliths as they determine fish migration, mortality, and stock structure. However, results of a study may be incomplete if otoliths are perturbed before their research experiment begins, whether it be how long the fish has been dead to how the otoliths are removed from the skull. Previous studies have suggested that different otolith storage techniques have minimal effects on the otolith's microchemistry but have not addressed possible changes to the CaCO₃ crystal structure. The purpose of this research is to test for changes in the crystal structure of otoliths stored using several common storage methods, including freezing, dry storage, and immersion in deionized water (DI H₂O), or in 95% ethanol (EtOH). After extracting otoliths from fish heads, they were stored using each method for up to 40 days. Fourier Transform Infrared Spectroscopy (FT-IR) was used to observe the otolith's microstructure at the beginning and end of storage through detailed spectra of the absorbances of infrared radiation of the sample versus its wavelength. Critical information from the otoliths crystal lattice structure reveals that specific storage techniques such as DI H₂O and 95% EtOH affected the otoliths' after they were extracted, whereas frozen or dry storage did not. The information extracted from the otolith data should be used to influence the storage techniques that fishery biologists choose to use, thereby minimizing possible impacts on otolith structure prior to analysis.

An Exploration Of "Good Government": The Republic of Sienna in its Golden Age, 1260-1355

Ryan Dunn

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While many typically regard the Middle Ages as an uncultivated, primitive period in European history, this paper discusses one significant exception. The Republic of Siena, located in modern Tuscany, lasted from 1125 – 1555 and developed a notion of what they regarded as "good government" mainly associated with its golden age (1260 – 1355). This paper argues that the Sienese framework for "good government" does two things: (1) sets the stage for the Renaissance a few hundred years before other Italian city-states did, and (2) provides universal lessons to those seeking to develop a virtuous, ethical government. Some of the factors that contributed to this medieval republic's excellence were holding expansive definitions of citizenship and the rights that that entailed, encouraging civic participation, funding the arts, developing a civic (not necessarily religious) religion, and most importantly, providing public works like medicine and education. The prescient Sienese political thinkers and government reformers developed a meritocracy that brings into question the notion that the Middle Ages were indeed the "dark ages," for medieval Siena was a budding republic that both revived antiquity and laid the ground for future republics to follow.

The Effects Of Positive Psychology On Positive And Negative And Emotion And Meaning In Life

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Positive psychology interventions have been shown to elicit significant benefits to one's well-being. In the study, we assessed the effects of a positive psychology intervention on college students on positive and negative emotion and meaning in life. Participants (N=36 total) were randomly assigned to the control or intervention group. We compared the intervention (INT) and control (CON) groups on positive and negative emotion and meaning in life at baseline and after the four-week intervention. The 2-way ANOVAs for each dependent variable (Group x Time) revealed no significant difference for group, time or the interaction, with one exception ($F(1, 17) = 4.0$, $p = .049$) for future hope, indicating an increase for all groups from pre to post. For each variable, INT responses moved in a favorable direction. In the secondary analysis comparing groups by their change over time (pre-post mean differences), there were several significant differences between INT and CON. The three significant outcomes were future hope ($p=0.022$), positive emotion ($p= 0.018$) and satisfaction with life ($p=0.022$). Adherence to the intervention was very high with INT practicing the intervention on 92% of the 28 intervention days for an average of 14 minutes per day. No statistical differences were observed between INT and CON, although all variables improved after the intervention. The participants recruited were currently attending Concordia University Irvine, a Christian Liberal Arts school. It may be plausible that these participants already had a good sense of wellbeing and positive emotion. The faith-based aspect of the university reflected on the students could explain the lack of statistical significance. The favorable trends in this study suggest that utilizing the same methods in a public or secular university or with a sample of individuals who score lower on the scales would show favorable, if not statistically significant improvements of an individual's positive emotions and meaning in life.

An Analysis Of Company Stock Performance In Response To Federal Government Unemployment Insurance Benefits

Owen Milligan

Faculty Mentor: Professor Michael Kinnen

The purpose of this paper is to assess the response of the consumer defensive sector of the stock market to the federal government's varying unemployment insurance policies during the recession of 2020. A literature review of the two recessions revealed differing policy approaches by the federal government's administrations. Preliminary research showed significant differences in the recovery of the 2008 and 2020 recession of the top twenty-five consumer defensive stocks on the U.S. stock exchange. Additionally, there were different recovery periods within the 2020 recession based on unemployment insurance benefits provided. Statistical analysis revealed differing recovery in at least one stage of relief. In response, an extensive literature review revealed opposing viewpoints on the efficacy of both monetary and fiscal policy during recessionary policies.

Comparison Of The Analgesic Properties Of Cannabidiol To Traditional NSAID Drugs On Injured

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Cannabinoids, small compounds found in Cannabis plants, have been used both medicinally and recreationally with increasing popularity. Δ^9 -tetrahydrocannabinol (THC) is one prevalent cannabinoid that produces psychoactive “highs” in its users. Cannabidiol (CBD) is another prevalent cannabinoid that lacks psychoactive components but has been shown as a potential and effective therapy for a number of clinical conditions. This experiment aims to examine CBD’s analgesic properties, as well as compare it to that of ibuprofen (IBP), an NSAID analgesic that is commonly used and prescribed. Zebrafish were used as a model organism for pain, wherein their top-dwelling behavior was individually observed following injury with vinegar, and treatment with either CBD, IBP, or nothing (“no analgesic” group, NEG). Drugs were administered topically by being mixed with tank water, and behavior was measured using a variation of the novel tank diving test. No statistically significant difference was observed between the three treatment groups ($p = 0.582$, SEM = 49.63, 49.52, 21.51 (NEG, IBP, CBD, respectively), $n = 15$ fish per treatment group). These results suggest that CBD does not exhibit any form of pain relief, however that conclusion cannot be made due to the statistical similarity of the IBP and NEG treatment groups. Future replications of this experiment should consider using known analgesics other than IBP, as well different doses of each drug, among other things. Though no definitive conclusions could be drawn at this time, this experiment might be useful as a stepping stone for future research about CBD and other cannabinoids.

TIER TWO WINNER

The Myth Of The Supermen And Their Confrontation With Death

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Great beings constantly crop up throughout the mythology of the human race. These mighty individuals represent the ideals of a society; what that civilization believes makes up a perfect human. Because of their status as an exemplar of a society's values, superhuman characters are often pitted against death in their stories as a mechanism to confront this traditional human fear by proxy. The modern superhero Superman is no exception, and he draws heavily from the mythology and literature that preceded him. Uncovering the historical roots of his character, examining the different cultures that informed him, and then critically examining Superman is exceedingly valuable in understanding modern values and conceptions of death. This essay will trace this history of ideas through Gilgamesh, Nietzsche, and the eugenics movement of the early 20th century and conclude with an examination of Clark Kent himself. Understanding how Superman overcomes death where both Gilgamesh and the Übermensch failed brings to light the values of hope, victory, and endurance that still embody the “American Way.”