## Introducing the #Tabstract – Using Tableau Public to create interactive abstracts A step toward knowledge translation and research reproducibility

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Research reproducibility and knowledge translation are among the biggest challenges facing modern day science [1]. Reproducibility asks whether we trust the findings we read in the scientific literature? Knowledge translation asks how we can demonstrate the value of true findings to the broader community outside the academy. One proposed answer to the knowledge translation challenge is by communicating through infographics (i.e. short for information graphic) [2]. Infographics are concise summaries of the key findings of a research study, conveying information in ways more likely to be remembered than standalone text [3,4]. However, infographics carry two major limitations: 1) they are not well-suited to address question of research reproducibility, because even less detail is usually provided regarding methodology used, and 2) virtually all infographics are static. Readers do not have access to explore the data that researchers analyzed to arrive at their conclusions. Modern day data visualization platforms – like Tableau Public [5] – may allow the scientific community to step forward and address both of these challenges through interactive research summaries or dynamic infographics – or as we propose calling it, a <u>#Tabstract</u> [6].

# Intriguing, Informative, Interactive - Three key dependencies for delivering an effective #Tabstract.

**Intriguing:** Part content, part aesthetics, this principle infers that #Tabstracts need to capture, and hold a user's attention immediately. A user is likely to decide whether to linger based on their initial impressions – before they engage with any of the interactive features that a data visualization platform may provide. Creators are recommended to leverage many of the previously published principles on effective infographic design. Among others, these recommendations include: limiting text where possible, prioritizing important concepts, understanding your audience, leveraging effective design principles to draw on the laws of perception and pre-attentive attributes, and rely on a consistent, accessible, complementary colour palette [7]. If the #Tabstract is intriguing enough, the user will want to explore and interact to find out more.

**Informative:** Researchers' central findings should be clearly displayed to the user as the 'takehome message'. However, while the primary message may take 'center stage' in the visualization, Tableau's native features like 'hidden layout containers' or 'tooltips' may allow researchers to include important methodological details within the #Tabstract, while not losing valuable visual real estate.

'Show the data, don't conceal them' [8,9] – is a call that has been increasingly common in the academic community, for good reason. As one example, a bar chart with error bars hides many of the important features of the data – including its distribution (e.g. normal/skewed), its range, and the number of observations within that bar. Replacing these visuals with jittered dot-plots, violin plots, or other more detailed/layered visualizations provide the viewer with far more information. Business intelligence tools are designed with these types of visualization capabilities.

**Interactive:** #Tabstracts take 'showing the data' to another level, allowing the user to explore the data for themselves. Like dashboards implemented in industry often allow stakeholders to explore their internal datasets, the interactivity within BI tools may catalyze this type of curiosity and exploration for interested readers of scientific work. Moreover, by providing users this type of exploration capabilities (like providing analysis code), lessens researchers' ability to 'cherry pick' interesting findings and engage in poor research practices (e.g. p-hacking, hypothesizing after the results are known, or dichotomous declarations based solely on p-values without clear effect sizes).

### **Real life example**

We have published an example of what a #Tabstract can do on Tableau Public to illustrate these benefits [6]. Since another recommendation to enhance research reproducibility has been to encourage de-identified, open data sources, so we felt it appropriate to use a publicly available dataset that was used to evaluate academy football players' passing actions based on maturation status [10]. The first three tabs of the dashboard are geared toward knowledge dissemination, visually presenting some key findings from Towlson & colleagues' paper [10], while the fourth and final tab provides the viewer the freedom to explore some of the data for themselves.



Figure 1: The first <u>#Tabstract</u> [6].

#### **Concluding remarks**

#Tabstracts may be a natural step toward scientific knowledge translation. Clearly the moniker #Tabstract links 'Tableau' with research 'abstracts', but the principles of interactive research dashboards/visualization could be implemented with several platforms (e.g. Microsoft Power BI, Qlik, R Shiny, Plotly, D3). Knowledge translation may be catalyzed through intriguing, and informative visual summaries of important research findings. Finally, allowing users to interact directly with the data take this yet another step – enhancing the users' experience, improving research reproducibility, and encouraging transparent research processes. **Acknowledgements** – While this article is written by a handful of authors, several others must be acknowledged. First, effective visual communicators in sport and exercise medicine (e.g. Yann le Meur) and in other fields (e.g. Edward Tufte, John Burn-Murdoch) have demonstrated the power of infographics and effective data visualization as a means of knowledge translation. Secondly, the Tableau Public community is filled with talented, enthusiastic artists who push the boundaries of design, analytics, and creativity every day. Finally, while I thought about this idea for a long time, I could not figure out a name I was happy with until Sheralyn Windt chimed in with the brilliant suggestion – #Tabstract.

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