



ELSEVIER

Contents lists available at ScienceDirect

Human Movement Science

journal homepage: www.elsevier.com/locate/humov

Graphonomics and its contribution to the field of motor behavior: A position statement

Arend W.A. Van Gemmert^{a,*}, Jose L. Contreras-Vidal^b^a Louisiana State University, School of Kinesiology, 112 Long Fieldhouse, Baton Rouge, LA, 70803, United States^b University of Houston, Department of Electrical and Computer Engineering, N308 Engineering Building 1, Houston, TX, 77004, United States

ARTICLE INFO

Keywords:
 Drawing
 Handwriting
 Hand
 Fingers
 Manual control

ABSTRACT

The term graphonomics was conceived in the early 1980s; it defined a multidisciplinary emerging field focused on handwriting and drawing movements. Researchers in the field of graphonomics have made important contribution to the field of motor behavior by developing models aimed to conceptualize the production of fine motor movements using graphical tools. Although skeptics have argued that recent technological advancements would reduce the impact of graphonomic research, a shift of focus within in the field of graphonomics into fine motor tasks in general proves the resilience of the field. Moreover, it has been suggested that the use of fine motor movements due to technological advances has increased in importance in everyday life. It is concluded that the International Graphonomics Society can have a leading role in fostering collaborative multidisciplinary efforts and can help with the dissemination of findings contributing to the field of human movement sciences to a larger public.

© 2015 Published by Elsevier B.V.

1. Some history about the emergence of the field of graphonomics

The term “graphonomics” was coined at the first conference organized by the International Graphonomics Society (IGS) in 1982 to label an emerging field of multidisciplinary research focused on movements produced with styli (i.e., pencils, pens, electronic pens, etc.). The first researchers in this field were interested in identifying lawful relationships between planning and generation of fine motor movements aimed at writing texts or drawing pictures (Meulenbroek & Van Gemmert, 2003). The fascination with these movements stemmed from observations that show the apparent ease that most individuals display when making these movements in spite of the complexity of the process to draw pictures and write texts (see for example the models of Bullock, Grossberg, & Mannes, 1993; Ellis, 1979; Van Galen, 1991; Van Sommers, 1984). However, the fast advancements made in the field of graphonomics could not have taken place without technological advancements. Moreover, before graphical tablets were available at a relatively low cost to a large number of researchers, a small group of researchers (the same ones that founded the International Graphonomics Society) explored the limits of the capabilities of computer processors, monitors, and graphical tablets in an effort to investigate different theories related to drawing and handwriting movements. In the late 1990s, these researchers, who were interested in drawing and handwriting, were joined by several researchers interested in the control of pointing and prehensile actions. The cross fertilization between these two groups resulted in a shift of focus from research solely aimed at handwriting and drawing movements to a focus on all aspects of fine motor movements involved in the use of graphical tools, such as prehensile movements, eye

* Corresponding author.

E-mail addresses: gemmert@lsu.edu (A.W.A. Van Gemmert), jlcontreras-vidal@uh.edu (J.L. Contreras-Vidal).

movements in relation to manual actions, and force control in fine motor tasks. This cross-fertilization led to very fruitful collaborations and resulted in a slowly increasing interest in IGS as a society not only for researchers focused on handwriting and drawing, but also for investigators interested in all aspects related to fine motor movements even when not directly related to handwriting and drawing. The papers presented at the conferences since 2001 prove this slow but steady increase of interest of researchers focused on aspects of fine motor performance not directly related to the traditional areas covered by graphonomics (see also [Meulenbroek & Van Gemmert, 2003](#); [Van Gemmert & Teulings, 2004](#)).

2. Technological advances and changes to the field of graphonomics

Whereas technology has made it easier to collaborate and collect data, recent advances also resulted in some critics arguing that handwriting and with it graphonomics would become less relevant ([Barrera, Rule, & Diemart, 2001](#)). Although it is true that the use of computer keyboards have reduced the amount of handwriting tasks in several settings, such as in offices and schools ([Medwell & Wray, 2008](#); [Sülzenbrück, Hegele, Rinkenauer, & Heuer, 2011](#)), handwriting- and drawing-like movements have increased in daily life (i.e., swiping movements, pointing, and writing movements on touch screen tablets, smartphones, and other similar devices). This transition of the use of drawing- and handwriting-like movements on new devices indicates that the field of graphonomics is still very relevant. Questions arising from the use of these technologies include questions such as: “What is the neural basis of fine motor skills?”; “What is the relationship(s) between visual, tactual, and auditory feedback and performance of accurate and/or fast movements using a stylus or the index-finger?”; “Does the transition in schools to use more and more keyboards instead of handwriting affect how children learn?”; and “Can we use new technologies, which require the use of graphic movements, to improve our ability to assess, diagnose or monitor disease?” These questions are only a small subset of the multitude of questions to which researchers in the field of graphonomics can contribute. Therefore, it is our belief that the field of graphonomics has a rich and prosperous future ahead, especially since the field embraces new areas relatively quickly, and thus the field is poised to stay relevant and expected to grow in importance. Of course, our beliefs are biased and they will only come to full fruition if IGS and its researchers stay at the forefront of the exploration of new technologies and keep on including and learning from researchers who traditionally were outside of the field of graphonomics. In the following paragraphs the reader will get a taste of the diversity of paradigms used and research areas included nowadays in graphonomics. It is our hope that we can interact in the future with the reader and/or can welcome him/her at one or more of our future IGS conferences.

3. Research exemplifying changes in the field of graphonomics

This special issue presents six research papers exemplifying how research is changing within the field of graphonomics and how graphonomic research stays relevant in a digital age as a result of these changes. These 6 papers stem from the 16th Conference of the International Graphonomics Society (IGS) held in Nara (Japan) in 2013. The aim spelled out by IGS is to advance the scientific study of handwriting, drawing, and related motor skills (i.e., graphonomics). Furthermore, the society states that it seeks to exchange views and expertise, promote joint-project research, and that it aims to disseminate and apply knowledge gained wherever appropriate to understand the processes involved in handwriting, drawing, and related motor skills. To achieve these goals the society organizes a conference every two years since its second conference in 1985 (the first conference was held in Nijmegen in 1982, so it was 3 years before the second one after which it became a regular fixture every two years). Another way to achieve the society’s goals is to publish selected papers presented at the conference. This issue reflects only a small portion of the diversity of multidisciplinary research in the field of graphonomics.

IGS 2013 informed by bringing together scientists from many different disciplines, such as neuroscience, computer engineering, pattern recognition, motor control and learning, experimental psychology, cognitive science, neuropsychology, education, forensic science, and fine arts. This diversity with the common goal to advance the field of graphonomics highlights the diversity and multidisciplinary disposition of the field of graphonomics. IGS 2013 received 49 contributions by 119 researchers coming from 15 different countries ([Nakagawa, Liwicki, & Zhu, 2013](#)). The presentations could be divided broadly into six different topic categories, i.e., (1) handwriting and signature verification issues in forensic sciences, (2) educational aspects of handwriting and fine motor function, (3) historical documents and the use of computer recognition models, (4) the online and offline recognition of handwriting and pen gestures, (5) the neuroscience of motor behavior in graphonomics, and (6) movement disorders affecting fine motor movements. These broad topics again testify to the multidisciplinary nature of the field of graphonomics. The papers assembled in this special issue represent a selection that resulted from a standard peer-reviewing process. These papers are very diverse, but the common thread is that the findings of all 6 papers have implications for our understanding how the control of fine motor movements is organized, which implicitly, and in some cases explicitly, permits insight into the architecture of the central nervous system that allow us to perform daily fine motor tasks.

4. The contributions

The first paper by *Robertson and Guest* (2015) shows how research in the field of graphonomics can stay relevant in a society that is quickly digitalizing. Their study addresses a problem that is the direct result of the acceptance of technological

Download English Version:

<https://daneshyari.com/en/article/928275>

Download Persian Version:

<https://daneshyari.com/article/928275>

[Daneshyari.com](https://daneshyari.com)