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OPINION
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A Greek Alphabet Guide for Research Methodology, Measurement, and Statistics

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INTRODUCTION

As a professor in Measurement and Research Methodology who is Greek, I have been asked many times about the proper pronunciation of the Greek letters that are typically used in this field. Some of the questions come from students in my courses, while others come from other colleagues in my field. Recently however, the COVID pandemic has created an additional platform in which the Greek letters are used, since the COVID variants have been named after Greek letters so far [e.g., delta (δ) variant, omicron (O) variant, etc.] (Harlan, 2021). This has spurred an increase in discussions and online articles regarding the proper pronunciation of Greek letters. For example, The New York Times published an article titled "How do you say 'omicron'?" (Hauser, 2021), while the Wall Street Journal had a similar article titled "However You Pronounce 'Omicron,' You're Probably Saying It Wrong" (Sharpe, 2021). However, although the average person might not be too worried about the proper pronunciation of the Greek letters, students and academics who use them in their work or for their courses are more interested in knowing how to pronounce them and how such letters are used. This is especially the case for people in the field of research methodology, measurement and statistics where Greek letters are frequently used. This uneasiness with the use of Greek letters might even be more pronounced with undergraduate students taking research methodology or statistics courses (Papanastasiou and Schumacher, 2014), which are now required in many universities around the world (Papanastasiou and Karagiorgi, 2019).

An examination of the literature can identify some efforts that have been made, mostly within course materials, to provide students with guidance on the use of the Greek alphabet for such purposes. Such attempts can be found within courses from Duke University (2022) and the University of New Mexico (n.d.). A closer look at such material, however, can determine that in many cases these efforts are not comprehensive; they are specifically targeted toward matching certain letters for each courses' needs, and have more to do with statistics rather than with measurement. Also, the adapted International Phonetic Alphabet to assist people in pronouncing the letters correctly is not typically provided for these purposes either.

Therefore, due to the recent increased interest in the pronunciation of Greek letters beyond their mere symbolism, the publication of the table below in an Open Access journal might serve as a useful tool for anyone who is interested in this topic. This table includes useful information on how the names of the Greek letters are actually pronounced in Greek, in addition to the sounds they actually represent. This table also provides the corresponding adapted International Phonetic Alphabet (IPA) sounds for each letter for people who might be familiar with the IPA.

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GREEK ALPHABET GUIDE

The letters presented in **Table 1** (Papanastasiou, 2003), represent the 24 letters of the Greek alphabet, and they are listed in the same order as they appear in the alphabet. So, the first two columns of **Table 1** represent the upper-case and the lower-case Greek letters. The third column includes the Latin letters that most closely approximate the sound of each letter of the Greek alphabet. However, some letters in the Greek alphabet have sounds that are not represented in the Latin alphabet (e.g., the letters δ, θ, ξ, and ψ), while in other cases, there are more than one letter that represent each sound. Such letters are the letters ι, υ, and η, which all correspond to the sound "ee." In addition, the letters ο and ω both represent the sound "o," with slight variations among them that have existed from ancient Greek.

The fourth and fifth columns of **Table 1** have been included to provide guidance on how to represent the letters in a way that would allow people to pronounce them. The fourth column, titled as "Sounds like," includes examples of English words that contain that sound which is included in bold in that word. For example, the letter θ sounds like the sound "th" in the word "**th**eme." In addition, the letter δ sounds like the sound "th" in the word "**th**eir." A slight variation exists with the letter τ since it represents a softer version of the "t" sound which is a sound in between the English sounds of "d" and "t." In order to clarify this distinction, the letter τ was used as part of the international phonetic alphabet to represent this softer sound.

The fifth column contains each letter's name, based on how it is pronounced in Greek. So, as presented in **Table 1**, the Greek letter ξ is pronounced as "ksee" and not "ksy," as has been mentioned in some books (e.g., Lord, 1980), while the letter ϕ is pronounced as "fee," not "fy."

The sixth column, which is a bit more technical, represents the way of pronouncing each letter's name, based on an IPA adaptation. The seventh column includes the corresponding phonetic IPA sounds of what each letter should sound like.

TABLE 1 | Greek letters, their pronunciation, and some representations.

Capital Greek letter	Small Greek letter	Corresponding English letters	Sounds like	Letter's name	Phonetic (IPA) pronunciation of letter's name	Phonetic (IPA) sounds	Examples of what it represents in statistics/ measurement
Α	α	A	**a**nother	halfa	[ál.fa]	[a]	Type I error/statistical significance level
Β	β	V	**v**alidity	veeta	[ví:.τa]	[v]	Beta weight/regression coefficient
Γ	γ	Y	**y**es	yhahmma	[γá.ma]	[γ]	Lower asymptote, or pseudo-guessing parameter
Δ	δ	Th	**th**eir	thelta	[δɛl. τa]	[δ]	Difference
Ε	ε	E	eff**e**ct	hepsilon	[ɛ.psi.lon]	[ɛ]	Error term/residual
Ζ	ζ	Z	**z**-score	zeeta	[zí:.τa]	[z]	Proportion-correct score
Η	η	Ee	m**e**dian	eeta	[í:.ta]	[i]	Eta-squared (η^2)
Θ	θ	Th	**th**eme	theeta	[θí:. τa]	[θ]	IRT ability level
Ι	ι	Ee	m**ea**l	yiota	[ió.τa]	[i]	–
Κ	κ	K	fa**c**tor	gkappa	[ká:.pa]	[k]	Kappa coefficient
Λ	λ	L	**l**ength	lamtha	[lám.δa]	[l]	Wilk's lambda
Μ	μ	M	**m**ean	mee	[mi]	[m]	Population mean
Ν	ν	N	**n**ormal	nee	[ni]	[n]	University of New Mexico. (n.d.)
Ξ	ξ	X	ta**x**i	ksee	[ksi]	[ks]	Number-right true score
Ο	Ο	O	**o**rdinal	omikron	[ó.mi.kron]	[o]	University of New Mexico. (n.d.)
Π	π	P	a**p**e	pea	[pi]	[p]	Pi = 3.14159…
Ρ	ρ	R	mo**r**e	rho	[Rç]	[r]	Correlation, reliability
Σ	σ	S	**s**tatistics	seehyma	[síγ.ma]	[s]	Sum, population standard deviation True score
Τ	τ	T	a**t**e	tahf	[τaf]	[τ]	
Υ	υ	Ee	m**e**dian	eepseelon	[í.psi.lon]	[i]	Random effects in HLM
Φ	ϕ	F	**f**igure	fee	[fi]	[f]	Phi-coefficient, normal cumulative distribution function
Χ	χ	H	**h**istogram	hee	[hi]	[h]	Chi-square (χ^2)
Ψ	ψ	Pps	i**ps**ilon	ppsee	[psi]	[ps]	Logit transformation
Ω	ω	O	**o**rdinal	omehya	[o.mɛ.γa]	[o]	Omega-square (ω^2)

Papanastasiou (2003).

Finally, the eighth column of **Table 1** provides examples of what the Greek letters represent in research methodology, measurement or statistics. It should be noted, however, that no examples have been provided for the letters ι, ν, and υ, due to the fact that they are very similar in the Latin alphabet, which makes it difficult to identify whether their use represents a Greek or an English (Latin) letter.

DISCUSSION

So, by examining **Table 1**, one can realize that although the Greek alphabet does have differences from the Latin alphabet, both have common symbols. The variations that do exist however, should not become a source of stress or anxiety for anyone, though. Especially when such guidelines are available. Hopefully, this table will serve as a valuable resource for students, for people who either utilize Greek letters for their work, research, or their courses, as well as for people who just have an interest in knowing how to pronounce Greek letters correctly. Also, with the help of this table, hopefully, the next time Greek letters are mentioned anywhere, there would be no need to comment with the phrase, "It's all Greek to me."

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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