Relative speeds of tap-typing and glide-typing in English, Italian, and Korean

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ABSTRACT
The relative speeds of two mobile device text input methods are compared, across three different languages. A 'standard' tap-typing system and a less common 'glide' typing system are tested in English, Italian, and Korean languages. Participants are timed while entering short phrases that are characteristic of mobile device text input. The findings suggest that tap typing is faster for text input, particularly in Korean. However, more research is needed to fully test the capabilities of glide typing input.

INTRODUCTION
Mobile devices continue to become more and more ubiquitous throughout global society. In 2015, Google announced that internet searches from mobile devices had overtaken the number of searches from computers in 10 countries including the US and Japan [3]. Latest statistics at the time of writing in 2018 show that mobile use accounts for 52% of all internet access worldwide [7].

A constant challenge for mobile device manufacturers is improving the speed and ease of text input. Mobile devices are limited in size and are ease of input is affected by their context of use; for example, device users often text while on the move, perhaps using only one hand. Therefore users struggle to achieve the same speeds on a mobile device as they do on a desktop computer.

The current standard method used by smartphones is a QWERTY virtual keyboard, where users tap virtual representations of keys to input individual letters. Users typically achieve speeds of approximately 50 words per minute (WPM) with this technique, in the English language [9]. This report will refer to this input method as 'tap typing'. Given the scale of mobile device use, any consistent improvement in speed that could be provided by an alternative typing method would have a huge net increase on smartphone-users' input efficiency.

One increasingly popular alternative to tap typing (in the UK and Italy) is an input method that is described under various names, including 'glide' typing, 'gesture' typing, and 'swipe' typing. We will refer to it from now on as 'glide typing'. Glide typing allows users to input a whole word by sliding their finger between the 'keys' shown on a virtual QWERTY keyboard. Users do not have to lift their finger from the screen between entering each letter. This also means that text input can be performed fluidly with one hand.

As a research group, we were interested in investigating whether glide typing provides a substantial increase in speed for users. Due to our fortunate situation of having access to native speakers of three different languages (English, Italian, and Korean), we decided to test the relative speeds of glide typing and tap typing in these three languages.

BACKGROUND
Glide typing was the invention of Cliff Kushler, who was also the inventor of the T9 predictive text system [6]. The first smartphone to use Kushler's 'Swype' system was released in 2009 [4]. Glide typing has since become more widespread: Google's release of the Android 4.2 operating system in 2012 advertised a 'gesture typing' system [10], and glide typing is currently available by default on all Android phones through Google's 'Gboard' keyboard. Gboard has been available for iOS users as a third-party keyboard download since 2016. Other third-party keyboards also support glide typing, including 'SwiftKey' and the aforementioned, but now discontinued, 'Swype' keyboard.

Previous studies have yet to fully support the claim that glide typing is faster than tap typing. This claim was made by 'Swype', whose website advertised the keyboard as the 'fastest on the planet' [12].

However, there are some caveats to previous studies. Nguyen and Bartha [8] found no significant difference in speed, but noted that they did not use a prediction algorithm for either input method. The prediction algorithm is particularly useful in glide typing, for correcting mistakes and interpreting mis-spelt versions of longer words. Given the ubiquity of Google's Gboard, it was decided that this study would use the full capabilities of the keyboard software, to better assess the real world value of the technology. Therefore, use of the prediction algorithm was permitted. Interestingly, study [8] noted that glide typing scored higher than tap typing when assessed for User Experience.

Anson et al. [1] had similar findings in an earlier study in 2012, with glide typing performing similarly to tap typing.

However, this study was performed using desktop computers, so its findings cannot be directly applied to mobile devices. It is also likely that improvements in glide typing algorithms and the supporting technology may give a different result in an updated study.

OBJECTIVE

The research question for this study can be summarised as:

- Is glide typing faster than tap typing, and does the language used affect the relative speeds of the two input methods?

Therefore, the study's goal was to assess the speed of each text input method, compare those speeds, and determine whether the language used has an impact on the relative speeds. The hypotheses for this study were:

1. Glide typing is faster than tap typing for English language.
2. Glide typing is faster than tap typing for Italian language.
3. Tap typing is faster than glide typing for Korean language.

Having reviewed previous studies comparing tap and glide typing, we reached the conclusion that the glide typing methods that were assessed (for example in [8]) did not fully explore the potential of the technology. Specifically, the AI that provides word predictions and automatic corrections was not utilised. This aspect of the technology is vital in allowing quicker text input. It serves to cope with mistakes and ambiguities that occur as a result of user error, or in cases where words share the same glide 'path'. For example, the english words 'hop' and 'hoop' share the same glide path, and the modern version of Gboard suggests both options to the user to enable fast correction of mistakes.

As a result, we hypothesised that glide typing, when used with prediction and correction tools, would in fact perform better (i.e. faster) than tap typing. We held that this would be true both for English and Italian languages, hence hypotheses 1 and 2 were formed.

Glide Typing was predicted to be harder than Tap Typing in Korean for two reasons:

1. Frequent 'extensions' are required for letters. The Korean alphabet initially starts with 24 letters (14 consonants and 10 vowels), but both consonants and vowels are frequently doubled to make new sounds or new letters (See Table 1). With tap typing, the shift key is normally used to have them doubled (or in some devices, a long press or double click). However, there is no way to have letters doubled within one 'glide' when using glide typing.
2. Placement of the letters on the keyboard. Korean letters are distributed in such a way that all the vowels are on the left side, and consonants on the right (see fig. 1). This works well when two hands are used on the physical keyboard, because consonants and vowels are used alternately to comprise one syllable. However, in glide typing, this means that one hand must glide across the screen and back for every syllable, increasing the required time to input a phrase.

These factors led to the formation of hypothesis 3: that tap typing would perform faster than glide typing in Korean language.

Singled	Doubled
ㄱ	ㄲ
ㄷ	ㄸ
ㅂ	ㅃ
ㅅ	ㅆ
ㅈ	ㅉ

Table 1: Doubled letters in Korean

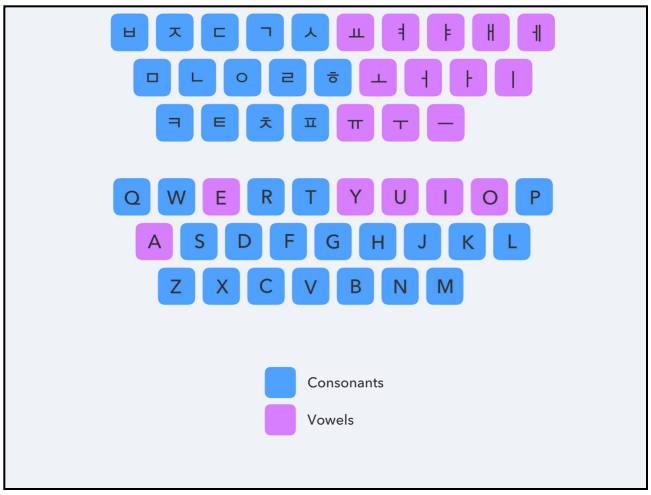

Figure 1: Placement of consonants and vowels on Korean and English keyboards

VARIABLES

Independent Variables

The independent variables used in this study were:

1. Language. The three languages tested were English, Italian, and Korean.
2. Text input method. The two input methods used in this study were 'tap-typing' and 'glide-typing'.

Dependent Variable

The dependent variable in this study was the speed of text input. Speed was operationalised by measuring the time taken to input a phrase, then dividing by the number of characters in that phrase. This ultimately gave time per

character as an inverse measure of speed; that is, the higher the time per character, the slower the typing speed.

Possible Confounding Factors

Message length and complexity
In all tests, the sentences used were of similar length and complexity. They were all around 30 characters long. No punctuation was used, apart from that which would be automatically added (in Italian). The words used were all words in common usage in their respective language, so that participants would have no trouble understanding them.

Participant language proficiency.
A requirement for selection was that all participants were native speakers of the language that they were being tested in. Participants were provided with an aural and visual prompt to negate any effects that spelling proficiency might have on performance.

User's familiarity with device.
To ensure that all users were fully comfortable with the operation, and particularly the size of the device, users were allowed to use their own device, after downloading the correct software (Gboard). This meant that the prediction and input interpretation software was kept constant, and no reduction in speed was suffered as a result of participants being unfamiliar with a handset. Any handsets that suffered from performance issues were not used.

User's skill with both typing styles.
Every participant has a unique level of skill and experience with both input methods. The participants' previous experience levels were queried in a questionnaire, in order to compare between languages and input methods. A training period was included in the test process, to enable familiarisation with unfamiliar typing methods.

Software
All tests were carried out using applications from google (either Gboard or Google Korean Input extension). This meant that the AI used by all languages was kept as similar as possible.

MATERIAL

To assess the participants' writing speed with each input method, the time taken to enter a short phrase in each participant's respective language was measured. The phrases were taken from MacKenzie and Soukoreff's paper entitled 'Phrase Sets for Evaluating Text Entry Techniques' [5]. The phrase set was developed to be "*moderate in length, easy to remember, and representative of the target language.*"

A subset of the 500 phrases in MacKenzie and Soukoreff's paper was taken, and then translated into Italian and Korean. Care was taken to ensure that the phrases remained memorable, and representative of the target language. The subset of phrases used can be seen in Appendix A.

The software used was Google's Gboard (for English and Italian) and Google Korean Input (GKI) for Korean. These are both free applications. These were chosen as Gboard is included on Android phones, and can be easily accessed by iOS users. GKI was used as it is the closest Korean equivalent to Gboard, having been developed by the same company. This means it is accessible, and is becoming more widespread, meaning that this study would be more generalisable than if a lesser known glide keyboard was used.

A short questionnaire was written to assess the participants' age, gender, native language, and their perceived level of experience with each input method. The questionnaire can be seen in Appendix B.

TASKS

Each participant was given a short questionnaire (Appendix B). They were then asked to enter 5 test phrases into a mobile phone 'note', using tap typing. Each phrase was timed separately, with each time being recorded by the testing researcher.

Then followed a training period for glide typing. Participants were given an introduction to the operation of glide typing, and were supplied with 7 test phrases to aid their practice. These times were not recorded.

Finally, each participant was asked to enter 5 test phrases using glide typing. Again these were recorded separately by the testing researcher.

These tasks were chosen because they reflect typical mobile phone use. A user is likely to enter short phrases using simple language, for example when writing a text message or social media post.

Breaking up the tasks into short sentences gives the option of excluding outliers if issues occur while writing one of the test phrases. It also reduces short term memory load on the participants, eliminating the participants' memory capabilities as a confounding factor.

Participants were allowed to use the predicted words and suggested alternatives that the software provides. This applies to both input methods. This makes the test closer to a real world situation, where users would naturally be allowed to use the suggestions.

PARTICIPANTS

Three groups of participants were selected to take part in this study - one group from each of three tested languages. Specific gender and age distributions were not targeted, as these were not thought to be relevant to typing speed, and therefore were not seen as confounding factors. Participants were selected using convenience sampling, and no reward or incentive was offered to the participants.

The group sizes and gender distribution is shown in Table 2. Age ranges of the participants are shown in Figure 2.

Native Language	English	Italian	Korean
Num. Participants	6	9	7
Gender Distribution (M:F)	3:3	6:3	1:6

Table 2: Participant Groups and Gender Distribution

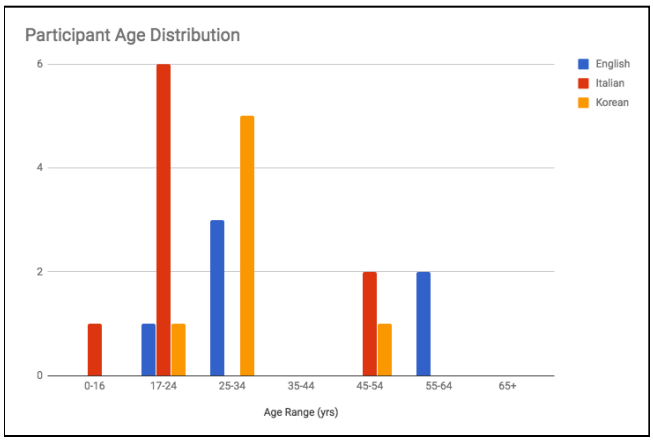

Figure 2: Participant Age Distribution

The participants' perceived typing skill is visualised in figures 3 and 4, by language. This was not tested, but was self-determined by the participants. This gave us a sense of how comfortable the participants were with using smartphones to type messages, and a comparison of experience between the two input methods.

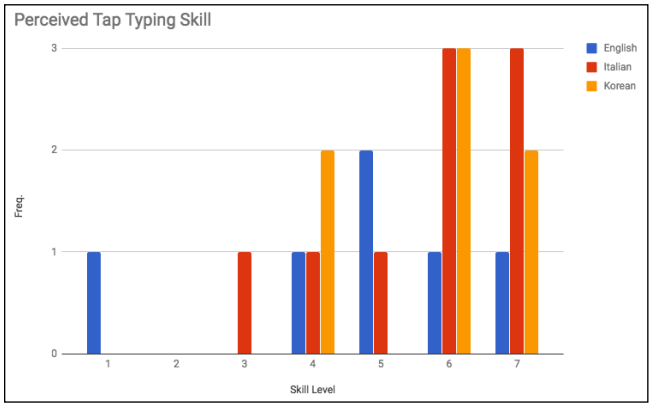

Figure 3: Perceived Tap Typing Skill Distribution

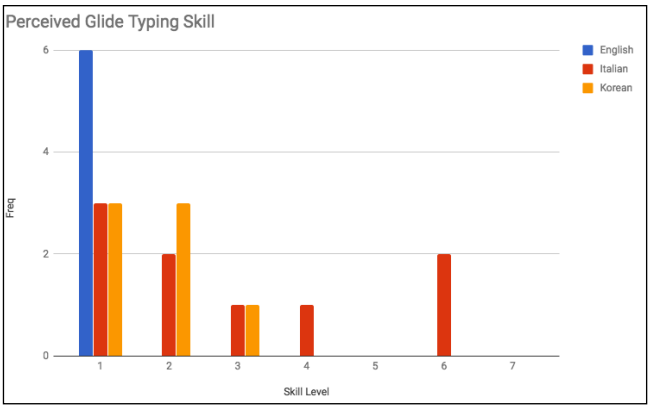

Figure 4: Perceived Glide Typing Skill Distribution

EXPERIMENTAL DESIGN

This study takes the form of a 3x2 Mixed Factorial study [2]. It is mixed because the independent variable of language is tested between subjects, while the other independent variable, input method, is tested within subjects. Therefore, 3 test groups were used. This is visualised below in table 3.

	English	**Italian**	**Korean**
Tap typing	Group A - test 1	Group B - test 1	Group C - test 1
Glide typing	Group A - test 2	Group B - test 2	Group C - test 2

Table 3: Study Design

A between-subjects design for the language variable was chosen due to restricted access to participants that have equal proficiency in all 3 languages. This means that this study cannot directly compare the absolute speeds gained by either input method between languages. This was a factor in the decision to test three separate hypotheses.

A within-subjects design for input method was chosen to reduce the variance in measured results as a result of individual differences between participants. This includes short term differences like tiredness or mood, and long term differences such as general typing skill and language processing skills. It also effectively allowed twice as many subjects as a between-subjects design, as participants perform tests under both conditions. This gives greater statistical power, and decreases the probability of a Type II error (that is, incorrectly rejecting the alternative hypothesis).

'Carry-over' effects of within-subject design were addressed. Fatigue was avoided by keeping the tests short enough to avoid participants becoming bored or tired. Practice or 'learning effect' was also avoided by keeping the number of tests small enough so that little improvement could be gained over the duration of the test.

CONDUCT

Before the test process, the purpose of the study was explained to the participant. Participants were assured that their data would be anonymised, would only be used for analysis within this study, and that they could leave the study at any time. The mobile device used was disconnected from internet and phone networks during the study. Participants were then given a short questionnaire to complete.

Participants' speed was then recorded for 5 tap typing phrases and 5 glide typing phrases, with a glide typing practice session in between, as described in the 'Tasks' section above. Each researcher conducted the test in their down native language (which was also the native language of the participant).

During the practice period, participants were informed about the operation of the glide typing software. Researchers could give them formally agreed advice during the practice session, but not during the timed tests. Specifically participants were informed that:

- Spaces were added automatically by the glide typing AI between each word - that is, when the participant typed another word after removing their finger from the screen.
- The word shown in bold above the keyboard would be the one 'printed' by the software to the message.
- Predicted words could be used to correct mistakes in most cases.
- Tapping individual letters was permitted for small corrections - e.g. adding an 's' to pluralise a word in english, or doubling letters in Korean as described in 'Objectives'.

For all tests, the mobile device was held in a portrait manner. Participants were shown the phrase on a slide show, before the researcher counted down to the timer starting. The timer was stopped when the user had correctly written the phrase, with no spelling errors. Capitalisation differences were permitted.

The above process was agreed prior to the tests, and followed by all researchers.

ANALYSIS

Figure 5 shows a box plot representation of input times measured for each test (in time per character). Table 4 shows additional descriptive statistics, by test. The geometric mean was calculated as the primary comparison value as it is less susceptible to large outliers. This is applicable for this test because task time data is positively skewed, due to a lower limit of 0 seconds, and the high probability of positive outliers [11].

For English, mean and median times were longer for glide typing than tap typing; meaning that in our tests, glide typing was slower. This was also the result for Italian text input, despite an outlier which is shown on figure 5. Tap typing in English was 28% faster than glide typing (by geometric mean), and in Italian tap typing was 19% faster.

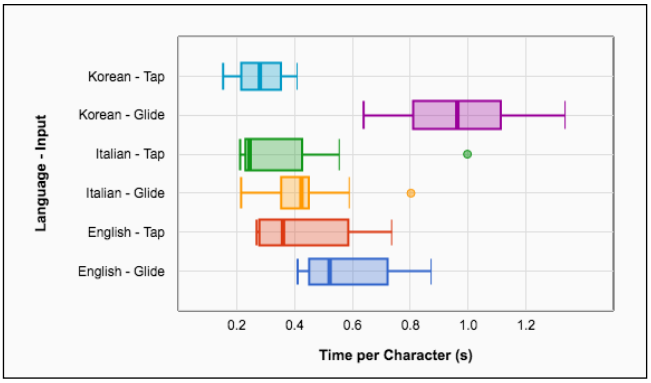

Figure 5: Box plot representation of input speed

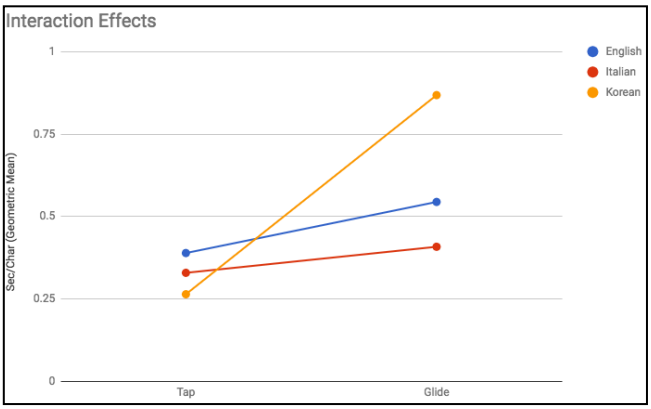

Figure 6: Mean time per character for each language and input method

For Korean, mean and median times for glide typing were a lot longer than tap typing, meaning that in this test participants using Korean language were much slower when using glide typing. The tests gave differences in mean and median of around 0.7s per character. Tap typing was 70% faster than glide typing by geometric mean.

Testing for Normal Distribution

Each of the 6 datasets were tested for normal distribution, using the Shapiro-Wilk test. This test was chosen as it is suitable for small sample sizes. The p-values obtained from the Shapiro-Wilk tests are shown in Table 5.

With an alpha level $\alpha = 0.05$, the only dataset for which the null hypothesis (that the data was drawn from a normally distributed population) could be rejected was for the test of Italian tap typing. While the tests did not reject this for the other datasets, the small sample sizes mean it is difficult to be certain that any errors within the data are normally distributed. Normal distribution is less likely when it is considered that task time data is often positively skewed, as referred to in the previous section.

Test	**Geometric Mean (s/c)**	Mean (s/c)	Median (s/c)	Min. (s/c)	Max. (s/c)	Std. Dev. (s/c)
English - Tap	**0.389**	0.431	0.368	0.269	0.735	0.192
English - Glide	**0.544**	0.583	0.534	0.411	0.872	0.177
Italian - Tap	**0.329**	0.384	0.258	0.219	0.997	0.258
Italian - Glide	**0.408**	0.443	0.403	0.215	0.802	0.170
Korean - Tap	**0.264**	0.283	0.260	0.153	0.409	0.096
Korean - Glide	**0.868**	0.969	0.858	0.639	1.335	0.237

Table 4: descriptive statistics for phrase input time

Input \ Language	**English**	**Italian**	**Korean**
Samples (n)	*6*	*9*	*7*
Tap typing	0.215	< 0.01	0.321
Glide typing	0.333	0.394	0.941

Table 5: p-values from Shapiro-Wilk normality test

Significance Testing

Because the sample sizes in this study are small, and the datasets cannot be reliably described as normally distributed, the significance test used here is non-parametric. As samples are dependent matched pairs that come from the same population (within language groups), the non-parametric alternative to the Paired Samples t-test is used: the Wilcoxon signed rank test. The Wilcoxon signed rank test used was one tailed, as the direction of change was predicted in the hypotheses. It should be noted that the Wilcoxon test does not provide an indication of the direction of a significant effect, but only of its presence.

The Wilcoxon signed rank test found that there were significant effects between the text input methods in all 3 languages ($\alpha = 0.05$). Z values were not calculated as the sample size is small and distribution is unlikely to be normal.

However, it is clear from the descriptive average results that hypotheses 1 and 2 (that glide typing will be faster for English and Italian respectively) are not supported by the data from this study. The data suggests that the opposite hypotheses are actually true. More discussion will follow in the next section.

Correlation between Perceived Skill and Speed

While this comparison does not directly affect the hypotheses, the accuracy with which participants reported their skill is interesting to note, as it can suggest the presence of a confounding factor. A Spearman's Rank test was used because the perceived skill was measured on a Likert scale from 1 to 7, and is therefore ordinal data.

The test found no correlation for English or Korean (English tap $r = 0.729$, glide $r = 0.5$; Korean tap $r = 0.411$, glide $r = -0.143$) when compared with critical values for this test under the respective values of n. However there were correlations in the Italian results (tap $r = 0.95$, glide $r = 0.875$) with respect to an alpha level $\alpha = 0.05$.

INTERPRETATION

English

Regarding hypothesis 1, that "Glide typing is faster than tap typing for English language".

It is clear that the results do not support this statement in any way. All averages of time per character (mean, geometric mean, median) support the null hypothesis: that glide typing is not faster than tap typing for the english language. In fact, they suggest that the opposite is true: that tap typing is faster. A significant effect was also found to suggest this.

An issue that was observed whilst participants used the glide typing input method was the unfamiliarity with the predictions and auto-corrections suggested by the keyboard software. Often, the software would indicate that it knew what the correct word was (by appearing in bold above the keyboard), but participants would continue to type out the rest of the word. A possible explanation for this is that participants were concentrating on finding the next letter rather than checking the suggestions.

Italian

Regarding hypothesis 2, that "Glide typing is faster than tap typing for Italian language".

Again, the results do not support this statement in any way. All averages of time per character (mean, geometric mean, median) support the null hypothesis: that glide typing is not faster than tap typing for the Italian language. Once more, they suggest the opposite: that tap typing is faster. A significant effect was found to suggest this.

Korean

Regarding hypothesis 3, that "Tap typing is faster than glide typing for Korean language".

This hypothesis is supported by the data. Tap typing performs faster when mean, geometric mean, and median are compared with that of glide typing, and a significant effect was found to support this. We could not reject the null hypothesis in this case.

The problems predicted prior to the study held true: that the frequent extensions to the letters caused mistakes and lengthened input time, as did the spatial separation between vowels and consonants. A third problem was also observed: the suggestions and predictions provided by the keyboard software were often incorrect or insufficient. This problem was not observed in the other languages that were assessed. This is likely to be due to the fact that support for Korean glide typing is newer than in English and Italian, and therefore the systems used to predict the intended input have not been improved to the same degree. The number of Korean users is likely to be much less than English users, meaning that there is insufficient data about which corrections are more effective.

Further Discussion

Given that glide typing had performed at least as well as tap typing in previous studies, without the use of predictions and suggestions, these results were unexpected. As a criticism of this study, it is possible that the training period that the participants undertook for glide typing was too short to fully familiarise the participant with the input method, in such a way that would happen after a more extended period of use as would happen in the real world. This is a threat to external validity, as real-life use of glide typing would differ. The correlation between participants perceived skill and speed in the Italian tests (the tests with highest number of samples and widest range of skill levels) suggests that more practice leads to higher speed.

This opens a question for further research - will glide typing still give slower results when participants have an extended practice period? A possible approach to this research question would be a longer term study, with participants encouraged to use glide typing for (e.g.) a week before testing that input method. For such a test, the expected difference in time between typing methods would be smaller, so it may be necessary to use larger sample sizes.

Given a longer familiarisation time, it would be interesting to further examine the suitability of glide typing for Korean language. Admittedly, this study found that glide typing was slower for all languages, but the interaction effect for Korean can be seen to be greater than in English or Italian (Figure 6). This might be said to be related to not only the familiarity of the participants with the input method but also technical incompleteness within the language. In particular, the fact that doubled letters that are frequently used in Korean language are not yet implemented in the tested application was observed to be the fatal issue in typing. Therefore, it would be worthwhile to conduct the study again with a better implementation of Korean glide input.

Little correlation was found between the participants' perceived skill and their speed. However, it is reasonable to doubt the accuracy of self-reported skill level as an indicator of actual familiarity with an input method.

THREATS TO VALIDITY

A possible criticism of construct validity in this study is the use of time per character as an inverse measure of speed, rather than the more widely used words per minute (WPM). Our justification for this is that mobile typing interactions are often very short, as were our test sentences. Using WPM as a measure when entering phrases that could vary so much in word count could skew the data if people made spelling errors during typing.

A threat to the internal validity of the study is the individual differences in typing skill. Although in most cases the reported skill level had no correlation with the speed, it is likely that individual differences had an effect on the results. Figures 3 and 4 show that in this study, participants rated themselves as more comfortable with tap typing. However, it is hard to accurately assess typing skill, other than by comparing between typing methods, as implemented here. Having a range of participant skill levels can also be said to improve external validity.

The small sample sizes in this study mean that generalising findings to the wider world is unwise. Even though a range of ages and typing skills were used, the sample size is too small to be normally distributed, and therefore the findings cannot yet be applied to the English, Italian, and Korean languages as a whole.

The narrow nature of the tasks assessed also mean that more investigation would be needed to apply results to all text input tasks. The test sentences here were all short, which means that conclusions cannot be drawn on the effectiveness of an input method for longer writing tasks, where physical fatigue may appear if the required motions are uncomfortable for the participant. Test sentences were also restricted in content; that is, no punctuation, emojis, proper nouns, or unfamiliar words were used. All of these are common in real world text input on mobile devices, and require different typing techniques than simple words. For example, typing punctuation symbols may require the user to navigate to a different screen, and proper names that are not recognised by the input software's internal dictionary may need to be typed out letter by letter, even when glide typing is used for the rest of the message.

The version of the software used also has an affect on external validity. The Korean version of the glide typing software, for example, was seen to have poor capabilities with regards to auto-correction, prediction and most of all the doubled letter typing. The software is relatively new, and is likely to improve in the future, so it would be unwise to disregard glide typing as an input method on the basis of one keyboard program.

CONCLUSION

This study unexpectedly gave data to suggest that tap typing is faster than glide typing, in English, Italian, and Korean. This finding was more pronounced in Korean language input, most likely due to differences in the layout of the characters on the keyboard, the doubling system used for some letters, and reduced prediction and auto-correct functions within the keyboard software.

More research is needed in order to compare tap typing with glide typing after a longer use period for each input method, in all three languages. This would enable stronger conclusions about which input method is faster in a real world setting.

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APPENDIX A - PHRASE SETS

English Phrases	Chars.	Italian Phrases	Chars.	Korean Phrases	Chars.
Set 1					
prevailing wind from the east	29	vento prevalentemente da est	28	동쪽으로부터 부는 바람	27
never too rich and never too thin	33	mai troppo ricco e mai troppo magro	35	너무 부유하지도 마르지도 않은	32
breathing is difficult	22	respirare è difficile	21	숨쉬기는 힘들다	20
I can see the rings on Saturn	29	posso vedere gli anelli di Saturno	34	나는 토성의 고리를 볼 수 있다	36
physics and chemistry are hard	30	fisica e chimica sono dure	26	물리학과 화학은 어렵다	29
TOTAL	143	TOTAL	144	TOTAL	144
Set 2					
my bank account is overdrawn	28	il conto in banca è in rosso	28	내 계좌는 초과 인출됐다	32
elections bring out the best	28	le elezioni mostrano il meglio	30	선거는 최선을 낳는다	27
we are having spaghetti	23	io mangio gli spaghetti	23	우린 스파게티를 먹고 있다	30
time to go shopping for bread	29	è ora di comprare il pane	25	빵 사러 갈 시간이야	23
a problem with the engine	25	c'è un problema col motore	26	엔진에 생긴 문제	21
TOTAL	133	TOTAL	132	TOTAL	133
Practice					
elephants are afraid of mice	28	gli elefanti hanno paura dei topi	33	코끼리는 쥐를 무서워 한다	31
my favourite place to visit	27	il mio posto preferito	22	내가 방문하고 싶은 곳	26
three two one zero blast off	28	tre due uno zero lanciare	25	삼 이 일 영 발사	20
my favourite subject is psychology	34	la mia materia preferita è psicologia	37	제일 좋아하는 과목은 심리학	34
circumstances are unacceptable	30	la situazione è inaccettabile	29	용납할 수 없는 상황	28
watch out for low flying objects	32	attento agli oggetti che volano basso	37	낮게 비행하는 물체를 조심해	33

if at first you do not succeed	30	se all'inizio non va bene	25	처음에 네가 성공하지 못하면	32
please provide your date of birth	33	fornisca la sua data di nascita	31	출생일을 입력하시오	25
we run the risk of failure	26	io corro il rischio di fallire	30	우리는 실패의 위험을 안고 있어	39
TOTAL	268	TOTAL	269	TOTAL	268

APPENDIX B - QUESTIONNAIRE

What is your gender?

Male Female I'd rather not say

What is your age range?

0-16 17-24 25-34 35-44 45-54 55-64 65+

What is your native language? (Free answer)

What is your skill level with tap typing?

Not skilled 1 2 3 4 5 6 7 Highly skilled

What is your skill level with swipe/glide typing?

Not skilled 1 2 3 4 5 6 7 Highly skilled