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Dutch Journal of Applied Linguistics
https://www.dujal.nl | E-ISSN 2211-7253

Adolescents and verb spelling: The role of gender and educational track in rule knowledge and linguistic attitudes

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Abstract The present paper examines the correlation between adolescents' gender and educational profile on the one hand and their knowledge of the Dutch verb spelling rules and spelling attitudes on the other hand. A two-part survey was conducted among 451 Flemish students from different educational tracks. We conducted this survey in order to complement our previous research in which we observed social patterns in adolescents' verb spelling errors on social media (Surkyn et al., 2019, 2020, 2021). Our results reveal that girls and theoretically oriented students care most about correct verb spelling. Moreover, theoretically oriented students have a better knowledge of the verb spelling rules. This survey provides additional evidence for the interpretation of the social patterns in our corpus research on Dutch verb spelling errors.

Keywords verb spelling errors, rule knowledge, spelling attitudes, gender, education

Article history
Received: August 3, 2021
Accepted: May 3, 2022
Online: September 12, 2022

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Author contributions
Hanne Surkyn, conceptualization, methodology, formal analysis, investigation, writing – original draft; Dominiek Sandra, writing – review and editing, supervision; Reinhild Vandekerckhove, writing – review and editing, supervision

Funding information
The research reported here was funded by the FWO (Research Foundation Flanders) under grant G023118N.

Conflicting interests
We have no conflicts of interest to disclose.

1 Psycholinguistic framework

Spelling errors on verb forms are notorious in Dutch. They even have their own name: *dt-fouten* ('dt-errors'). The cluster *dt* refers to a verb form ending that triggers many errors, the *d* being a stem-final letter and the *t* the orthographic marking of an inflectional suffix. These errors are highly persistent and also produced by highly skilled writers (e.g., adults and older teenagers). Paradoxically, the spelling rules are easy to describe, as they reflect the application of two spelling principles: a phonological and a morphological principle. The former is the basis of the Dutch spelling system: Spell what you hear. Sometimes, however, this principle is overruled by the morphological principle. The latter guarantees that morphemes have a constant spelling across all forms in which they occur.

Together, these principles generate homophonous inflected verb forms, i.e., forms that are pronounced in the same way but spelled differently. For example, the 1st and 3rd

How to cite Surkyn, H., Sandra, D. and Vandekerckhove, R. (2022). 'Adolescents and verb spelling: The role of gender and educational track in rule knowledge and linguistic attitudes', *Dutch Journal of Applied Linguistics* 11: DOI 10.51751/dujal10932

person singular present tense forms *vind* ('find') and *vindt* ('finds') are both pronounced as [vɪnt] but have a different ending (⟨d⟩ vs. ⟨dt⟩). The former coincides with the stem *vind* and ends in ⟨d⟩ because a [d] is heard in the infinitive *vinden* ('to find'). The ⟨d⟩ is pronounced as [t] due to final devoicing. The letter ⟨t⟩ is attached to the stem in the 2nd and 3rd person forms[1], as a [t] is heard after the stem in verb forms with the same grammatical function and a stem that does not end in the sound [t] (e.g., *hij loopt*, 'he runs'). A second verb type yields homophones in the 3rd person singular present tense and the past participle: *gebeurt* ('happens') – *gebeurd* ('happened').

Even though the spelling rules are taught as early as the fourth year of primary school and errors are signaled throughout high school, many errors occur on these verb homophones (e.g., Assink, 1985; Sandra et al., 1999). This is surprising, as early teaching and repetition lead one to expect error-free performance. Consequently, the errors are laden with stigma: Anyone who makes them must lack intelligence or be lazy (Verhaert & Sandra, 2016). However, psycholinguistic research (e.g., Frisson & Sandra, 2002; Sandra et al., 1999; Sandra & Van Abbenyen, 2009) revealed three factors that account for the error persistence. First, since verb homophones account for only 5 to 10 % of all verb forms (see Verhaert et al., 2016), their (morpho-graphic) spelling rules, as described above, must be applied rarely. This low occurrence frequency prevents an automatization of the spelling rules. Hence, rule application requires working memory resources. Second, working memory overload may prevent that the spelling rule is applied in time. Third, if this happens, the more accessible higher-frequency form may be activated by an automatic retrieval process. Consequently, many spelling errors are made when the lower-frequency homophone is correct (Sandra et al., 1999; Sandra & Van Abbenyen, 2009). This effect of homophone intrusions has been called the homophone dominance effect (Sandra et al., 1999). It was established not only in *experimental* research but also in *perception* studies (e.g., Verhaert et al., 2016) and *natural* writing contexts (e.g., in social media, e.g., Schmitz et al., 2018; Surkyn et al., 2020).

The factors mentioned above explain why even good spellers still occasionally make these errors. However, not all spellers know the rules or are able to apply them. Despite their descriptive simplicity, they require grammatical awareness to identify, for instance, the subject of a sentence. In a recent study, Chamalaun and colleagues (2021) showed that adolescents who could identify the grammatical function of verb homophones spelled 51 % of these forms correctly, whereas those who had problems with grammatical analysis spelled only 10 % correctly. Hence, spellers also make errors on verb homophones because they fail to determine their grammatical function. At the same time, a proper grammatical knowledge did not guarantee correct verb spelling: Still 49 % verb forms were misspelled. Grammatical knowledge is not a license for correct rule application. Hence, cognitive limitations but also poor rule knowledge or poor rule application cause errors. Finally, adolescents' spelling attitudes may have an impact on the errors. Some are likely to care more about errors than others and more meticulously monitor their spelling output.

2 Sociolinguistic framework

In this study, we examine adolescents' knowledge of Dutch verb spelling rules and their spelling attitudes. We will do so in relation to two social variables: gender (boys vs. girls) and educational track (general vs. technical education). The aim of our survey is to gain a better understanding of the social differences established in our previous research (Surkyn et al., 2019, 2020, 2021). In these studies, we examined the spelling of Dutch verb homophones in adolescents' private, informal social media writing, more specifically, on Facebook Messenger and WhatsApp. Although all teenagers fall prey to the same type of errors, boys produce significantly more verb spelling errors in their chat posts than girls, and adolescents following a curriculum in technical education (which is more practice-oriented than a curriculum in general education) make significantly more errors than their peers in general education.

We argued that the gender effect is not likely due to a difference in rule knowledge, as there is no reason to assume that boys have less knowledge of the verb spelling rules than girls. Rather, boys and girls are more likely to have a different attitude towards standard spelling norms. Sociolinguistic research has reported that women are more concerned with "sociolinguistic norms that are overtly prescribed" (Labov, 2001, p. 293) and avoid stigmatized forms more than men (e.g., Tagliamonte, 2011, p. 32). Spelling errors on Dutch verb forms are actually highly stigmatized as a result of the clear-cut spelling rules outlined above. Hence, we concluded that the gender difference might be related to a higher error awareness and norm sensitivity in female chatters (see Surkyn et al., 2019, 2020, 2021).

Furthermore, we suggested that differences between educational tracks are most probably related to differences in rule knowledge. The curriculum in general education (GE) of Flemish secondary education has a strong theoretical orientation and prepares students for higher (university) education. The curriculum in Flemish technical education (TE) has both a practical and a theoretical orientation. Students in TE proceed to higher education (but generally much less to university than GE students) or they can start their professional career after graduation. Those in more theory-oriented tracks of GE are likely to have a better knowledge of verb spelling rules and better metalinguistic skills, as their official curriculum focuses more on reflection on linguistic concepts in general and spelling principles in particular than the curriculum for the more practice-oriented tracks of TE (VVKSO, 2014). Consequently, teachers in GE insist more on the importance of correct verb spelling, and in many cases students' verb spelling errors (in, for example, their tests or exams) are sanctioned. This different educational focus on verb spelling might result in a more outspoken attitude towards error avoidance. Moreover, in view of their official school curriculum, GE students are likely to be exposed more frequently to (formal) standard writing (e.g., novels or proof-read texts) and thus also to correctly spelled verb forms, which might positively affect the quality of their orthographic representations (of, for example, verb forms) (The Lexical Quality Hypothesis, e.g., Perfetti,

2007; Perfetti & Hart, 2002). The quality of an orthographic representation refers to the accurateness with which a word's graphemes are represented in the mental lexicon (e.g., the vowel sound in the word *feel* is spelled as ⟨ee⟩). Students in technical education, by contrast, might be subject to a proportionately higher exposure to misspelled verb forms. Indeed, taking into account their school curriculum, we may expect their experience with standard writing to be more limited and their relative exposure to (nonstandard) social media writing consequently to be higher.[2] In addition, teenagers from different educational tracks probably differ in terms of their exposure to Dutch. Previous research by Hilte et al. (2018) on the same social media corpus revealed that Dutch is more often not the home language of the students in more practice-oriented tracks than of those in more theory-oriented tracks.

By examining adolescents' rule knowledge and spelling attitudes, we are able to test our earlier interpretations. Hence, we investigate (1) whether boys and girls indeed master the verb spelling rules equally well but have different spelling attitudes, and (2) whether theoretically oriented adolescents have a better knowledge of the verb spelling rules and, as a possible result, attach more importance to correct verb spelling. We will do so by conducting a two-part survey. In the first part, participants' knowledge of Dutch verb spelling rules is probed by means of basic verb conjugation exercises. In a second part, we use ten attitude statements about correct verb spelling in different writing situations to gauge the spelling attitudes of the adolescents.

3 Method

3.1 Participants

The survey was conducted in 14 different secondary schools in Flanders (the Dutch-speaking part of Belgium). All participants (n = 451) were between 16 and 20 years old and attended the final two years of secondary education (so-called 'third grade'). Table 1 presents an overview of these participants in terms of gender and educational profile.

3.2 Materials

3.2.1 *Part I – Rule knowledge*

In the first part of our survey, we tested participants' knowledge of the spelling rules of the simple present (exercise 1) and the past participle (exercise 2).[3] Participants were asked to conjugate a number of verbs. To rule out the possibility that errors were affected by the grammatical terminology, the goal of the exercise was illustrated with the example verb *werken*, 'to work'. This is a verb without a stem-final /d/ or /t/. It causes no spelling problems because its inflected forms are written as they are pronounced. In addition,

Table 1 Distribution of participants across gender and educational track

	Educational track	
Gender	**General education**	**Technical education**
Boys	95	102
Girls	154	83
x	13	4

participants were asked to describe the spelling rule or mnemonic they used to conjugate the verbs. They also indicated, on a 5-point Likert scale, how certain they were about their spellings.

Six verbs had to be conjugated in the simple present (exercise 1): two verbs whose stem ends in /d/ (*antwoorden*, 'to answer', *melden*, 'to report'), one verb with a stem-final /t/ (*pesten*, 'to bully') and three verbs without a stem-final /d/ or /t/: (*bedoelen*, 'to mean'; *gebeuren*, 'to happen' and *zeggen*, 'to say'). For each verb, the participants were asked to spell the 1st, 2nd and 3rd person singular.[4] Hence, they had to produce 18 verb forms. The 1st person singular is spelled as the stem of the verb (e.g., *antwoord*, *bedoel*, *zeg*). The 2nd and 3rd person require a *-t* suffix after the stem[5] (e.g., *antwoordt*, *bedoelt*, *zegt*). The example below illustrates the format for this exercise. The English translation was added next to the exercises for the purpose of this paper only.

(1) *antwoorden* *to answer*

Ik	_____	*I*	_____
Jij	_____	*You*	_____
Hij/Zij	_____	*He/She*	_____

The past participle of the same six verbs had to be spelled in exercise 2. The morphological structure of regular Dutch past participles is prefix (mostly *ge-*) + stem + suffix. The suffix is spelled as ⟨d⟩ or ⟨t⟩, depending on whether the stem-final sound is voiced or not, respectively. As the spelling of the past participle is independent of the grammatical number of the subject, only the 3rd person singular had to be conjugated per verb. Hence, six past participles had to be spelled. The format of this exercise is presented below:

(2) *antwoorden* *to answer*

Zij heeft	_____	*She has*	_____

These exercises are so simple that participants who know the rules should make no mistakes. In light of the above arguments, we expect that (1) students in technical education will perform less well than students in general education, and (2) that boys and girls will do equally well.

3.2.2 *Part II – Spelling attitudes*

The second part of the survey focuses on the adolescents' spelling attitudes by means of 5-point Likert scale items: eight statements on the importance of a correct verb spelling in formal school contexts and informal (social media) contexts. In addition, participants indicated their (dis)agreement with two statements concerning their own command of the verb spelling rules. Hence, the statements fall into three groups: formal school context, informal (social media) context, and perceived rule mastery. The ten statements, grouped by type, are listed in Table 2.

Note that high scores for statements that gauge the importance of correct spelling (statements 1, 3, 4, and 7) are likely to correspond with low scores for statements that gauge the acceptability of verb spelling errors (statements 2, 5, 6, and 8), and vice versa. By using alternating poles, participants are forced to read each statement carefully. In addition, the statements were not ordered by communicative context but alternated between types.

In informal contexts, spelling correctness is expected to be more important for girls than for boys and for theoretically oriented students than for their peers from technical education. These predictions are based on our earlier findings of gender and educational differences in error rates in informal social media writing (Surkyn et al., 2020, 2021). In formal contexts, teenagers in technical education are also expected to care less about correct spelling, as the focus on principles of Dutch spelling in their curriculum is considerably smaller. Finally, we expect boys and girls to rate themselves equally high with respect to their knowledge of the verb spelling rules, as we have no reason to assume that boys know these rules less well than girls. However, we expect TE teenagers to rate themselves lower than GE teenagers, as less attention is given to Dutch spelling principles in their educational track.

3.3 Procedure

The students were in their classrooms and so was their teacher. They received a small booklet of six pages. We asked their permission to use their answers.[6] Participation was anonymous: We only asked general profile information (e.g., gender, educational track, dyslexia). Participants could take as much time as needed to complete the survey. They were allowed to return to a previous question. In previous verb spelling experiments, time-pressure was often imposed to create a sufficiently high error risk, as the focus was on the role of working memory limitations and long-term memory in triggering and shaping errors (e.g., Sandra et al., 1999). These researchers

Table 2 Attitudinal statements grouped by type

Formal school context
Ik vind het belangrijk om werkwoorden correct te schrijven in taken voor school. 'It's important for me to write verbs correctly in tasks for school.'
Dt-fouten in toetsen op school zijn aanvaardbaar. 'Verb spelling errors in school tests are acceptable.'
Ik vind het belangrijk om werkwoorden correct te schrijven in berichtjes naar leerkrachten. 'It's important for me to write verbs correctly in messages to teachers.'
Ik vind het belangrijk dat leerkrachten Nederlands (ASO, TSO) of PAV (BSO)[7] *werkwoorden correct schrijven.* 'It's important to me that teachers of Dutch (GE, TE) or PAV (PE) write verbs correctly.'
Dt-fouten in berichten van leerkrachten die een ander vak dan Nederlands (ASO, TSO) of PAV (BSO) geven, zijn aanvaardbaar. 'Verb spelling errors in messages from teachers who teach a subject other than Dutch (GE, TE) or PAV (PE) are acceptable.'
Informal (social media) context
Dt-fouten in gesprekken via WhatsApp of Facebook Messenger zijn aanvaardbaar. 'Verb spelling errors in conversations via WhatsApp or Facebook Messenger are acceptable.'
Ik vind het belangrijk om werkwoorden correct te schrijven in berichtjes naar vrienden. 'It's important for me to write verbs correctly in messages to friends.'
Dt-fouten in berichtjes naar familieleden zijn aanvaardbaar. 'Verb spelling errors in messages to family members are acceptable.'
Perceived rule mastery
Ik vind van mezelf dat ik de spellingsregels van werkwoorden goed beheers. 'I consider myself to have a good command of the verb spelling rules.'
Ik betrap mezelf vaak op dt-fouten. 'I often catch myself making verb spelling errors.'

 DOI 10.51751/dujal10932

wanted to simulate conditions in which spellers have insufficient time to consciously apply the spelling rules. In contrast, in Part I we are interested in the ability of conscious rule application, and, hence, wanted to exclude errors resulting from time pressure.

4 Operationalization of the research variables

4.1 Dependent variables

In the analyses of Part I, the dependent variable was the overall correctness of the exercise (simple present, past participle). Hence, we made a binary distinction between a completely faultless answer, i.e., 18 (exercise 1) or 6 (exercise 2) correct spellings, and a non-faultless answer, i.e., an answer with one or more errors. Each participant was thus given a score of 1 (faultless) or 0 (non-faultless) for each exercise. The rationale is that, if participants know the verb spelling rules, they should be faultless on these basic spelling exercises.

In Part II, the participants indicated their agreement on ten statements about the importance of correct verb spelling in different situations on 5-point Likert scale items: 'completely disagree', 'disagree', 'neutral', 'agree', and 'completely agree'. We transformed this dependent variable into a binary variable, distinguishing between explicit agreement ('agree' + 'completely agree') versus absence of explicit agreement ('completely disagree' + 'disagree' + 'neutral').

4.2 Independent variables

We examined the role of two social factors: gender and educational track. The factor *Gender* was operationalized as a binary variable, as students predominantly identified themselves as boys or girls.[8] The second social factor was *Educational Track*. Participants were enrolled in general secondary education (called *algemeen secundair onderwijs* or *aso*), i.e., the theory-oriented tracks, or technical secondary education (called *technisch secundair onderwijs* or *tso*).

In addition, we asked participants to describe the spelling rules or mnemonics they used to conjugate the verb forms. We scored their responses as correct ('1') or incorrect ('0') for the simple present and past participles, separately. We hypothesize that participants who correctly describe the rule or mnemonic, have a better knowledge of the spelling rule. Moreover, participants indicated on a 5-point scale how certain they were about the correctness of their verb spellings, using again two separate scores for simple present and past participle. We converted this ordinal response to a binary variable, distinguishing between 'confident' (4 and 5) and 'unconfident' (1 to 3). We assume that teenagers who are confident about their answers will perform better.

5 Results

5.1 Part I – Rule knowledge

5.1.1 *Overall performance*

After removing data from students with dyslexia[9] (n = 26), respondents with gender 'x' (n = 17), and participants who did not complete Part I (n = 10), we analyzed the data of 400 adolescents (Table 1). Overall, 56.25 % of them spelled all present tense forms (exercise 1) without making an error; 59.00 % made no errors on the past participles (exercise 2).

5.1.2 *Model Building Procedure*

The data of each exercise were analyzed with a separate generalized linear model, using the glm function from the lme4 package (Bates et al., 2015) in the statistical software package R (R Core Team, 2014). We followed a backward stepwise procedure[10], starting from a complex model in which the dependent variable was predicted by all independent variables.[11] Next, nonsignificant factors were removed from this model step by step. Likelihood ratio tests ($\alpha = .05$) were used to compare the nested models. When more than one factor was nonsignificant, we removed these factors from the model in different orders to make sure that our final model did not depend on ad hoc decisions concerning order of removal. Finally, we added to the remaining model all possible interaction terms between the factors, once again step by step (and, again, in all possible orders).[12]

For each model, the Variance Inflation Factor (VIF) was calculated to check the collinearity among the predictors. We conducted a GVIF test, the generalized version of VIF introduced by Fox and Monette (1992), based on a generalized linear model in which the binary response variable (overall correctness of the exercise) was predicted by all design factors listed above. The GVIF test indicated that multicollinearity was no cause for concern: All squared generalized VIF scores were smaller than 1.52[13], i.e., well below the conventional threshold of 4 above which collinearity between the predictors is potentially problematic (Hair et al., 2010).

5.1.3 *Model output*

5.1.3.1 Exercise 1: Simple present

Table 3 gives the output of the best fitting statistical model. The intercept is the mean performance of participants in GE who scored '0' for the factors *Description Spelling Rule*, *Spelling Confidence* and *Overall Correctness Exercise 2*. The analyses revealed differences between the educational tracks: GE students were significantly more likely to spell all present tense forms correctly than TE students ($z = -4.36$, $p < .001$): 75.32 % of the GE students made no single error vs. 30.18 % of the TE students. Gender was not correlated with the overall correctness of the exercise ($p = 0.16$); hence, this factor was not included in the final model. The same results were observed in an item analysis, in which the dependent variable was the item performance across participants (correct = 1,

Table 3 Final model Exercise 1 (simple present)

Predictor	Estimate	SE	*z*	*p*	
Intercept	−1.216	0.486	−2.50	0.012	*
Educational Track (TE)	−1.194	0.274	−4.36	<.001	***
Description Spelling Rule (1)	0.783	0.499	−1.57	0.116	
Spelling Confidence (1)	0.436	0.544	0.80	0.423	
Spelling Confidence (1) : Description Spelling Rule (1)	1.487	0.632	2.35	0.019	*
Overall Correctness Exercise 2	0.571	0.270	2.12	0.034	*

Residual deviance: 371.84 on 394 degrees of freedom

incorrect = 0): TE students made significantly more spelling errors on present tense forms than GE students (z = 6.58, p < .001), while boys and girls did not significantly differ (p = 0.90).

Furthermore, the factors *Description Spelling Rule* and *Spelling Confidence* interacted. Only among participants who reported to be confident about their spelling production, the description of the spelling rule played a role in the overall correctness of the exercise. In other words, among the confident participants, those who were able to describe the spelling rule (or a mnemonic) were significantly more often faultless than participants who described an incorrect or incomplete rule or left this question unanswered (z = 2.35, p < .05): 81.33 % vs. 24.49 %. Finally, participants were more often faultless in exercise 1 (simple present) if they made no errors on the past participles in exercise 2 (z = 2.12, p = .034): 69.07 % vs. 37.80 %.

5.1.3.2 Exercise 2: Past participle

The output of the best fitting statistical model is presented in Table 4. The intercept is the mean performance of GE students who scored '0' for *Description Spelling Rule* and '0' for *Spelling Confidence*. We found a significant difference between GE and TE students: The former were significantly more likely to spell all past participles correctly than the latter (z = −2.76, p = .006): 74.03 % vs. 38.46 %. Again, *Gender* did not significantly improve the model (p = 0.83) and, hence, was not included in the final model. An item analysis revealed a similar result: TE students made significantly more spelling errors on past participles than GE students (z = 2.53, p = .011), whereas boys and girls did not significantly differ (p = 0.15).

Participants who were able to describe the spelling rule (or a mnemonic) were significantly more often faultless than participants who could not (z = 7.86, p < .001): 86.77 % vs. 34.12 %. Furthermore, the results showed a correlation between the correctness of the exercise and *Spelling Confidence*: Participants who were confident were significantly

Table 4 Final model Exercise 2 (past participle)

Predictor	Estimate	SE	*z*	*p*	
Intercept	−1.289	0.296	−4.35	<.001	***
Educational Track (TE)	−0.737	0.267	−2.76	0.006	**
Description Spelling Rule (1)	2.244	0.285	7.86	<.001	***
Spelling Confidence (1)	1.712	0.278	6.17	<.001	***

Residual deviance: 361.58 on 396 degrees of freedom

more often faultless ($z = 6.17$, $p < .001$): 74.81% vs. 28.99%. Finally, performance on the first exercise played no role in the second one ($p = 0.33$).

5.2 Part II – Spelling attitudes

After excluding respondents with dyslexia (n = 26), gender 'x' (n = 17), and those who did not complete the entire second part (n = 23), 388 participants remained. Their results were analyzed with generalized linear models, using the same procedure as above. For each statement, we checked the potential correlation with *Gender* and *Educational Track*. We also tested whether the two social factors interacted. This was not the case for any of the statements. Below, we discuss the results of the statements by category. Table 5 gives an overview of the results per statement. The final models for these statements can be found in the Supplementary material.

5.2.1 *Formal school context*

In general, adolescents indicated to attach much importance to correct spelling in formal writing contexts: 93.04% considered it important to spell verb forms correctly in school tasks and only a minority (22.68%) considered verb spelling errors in school tests acceptable. However, more GE students (98.27%) attached importance to correct spelling in school tasks than TE students (85.35%) ($z = -3.83$, $p < .001$) and almost twice as many TE students (31.21% vs. 16.88%) indicated that spelling errors in school tests are acceptable ($z = 3.27$, $p < .01$). Gender differences were less outspoken. The factor *Gender* played no role in the statement about the acceptability of spelling errors in school tests ($p = 0.30$). Yet, girls (96.31%) seemed to attach more importance to correct verb spelling in school tasks than boys (88.89%) ($z = 1.96$, $p = .05$).

The vast majority (93.30%) agreed that a correct spelling of verb forms in messages to teachers is important. Girls (97.24%) attach more importance to correct spelling in this writing situation than boys (88.30%) ($z = 2.57$, $p < .05$) and GE students considered this more important than TE students (98.27% vs. 85.99%, $z = -3.64$, $p < .001$).

Finally, 93.56% of the participants expected teachers of Dutch to spell verb forms correctly, whereas 16.49% considered verb spelling errors in messages from other teachers acceptable. Significantly more girls attached importance to teachers' correct verb spelling than boys, both in their expectations of teachers of Dutch (97.70% vs. 88.30%, $z = 2.90$, $p < .01$) and their tolerance towards errors by other teachers: 10.60% vs. 23.98%, $z = -2.74$, $p < .01$). Similarly, GE students were stricter for teachers of Dutch than TE students (97.40% vs. 87.90%, $z = -2.90$, $p < .01$) and less tolerant towards errors by other teachers (9.52% vs. 26.75%, $z = 3.81$, $p < .001$).

5.2.2 *Informal (social media) context*

While the above results reveal a broad overall consensus on the importance of correct verb spelling in formal writing situations, the opinions were more divided with respect to errors in informal (social media) contexts. This variability resulted in a proportionally larger error tolerance in the latter situations.

Slightly more than half of all participants (57.21%) agreed that verb spelling errors in conversations via WhatsApp and Facebook Messenger are acceptable. *Gender* and *Educational Track* played a significant role. Whereas only half of all female participants (i.e., 50.69%) agreed with this statement, a clear majority (65.50%) of the male participants thought such errors were acceptable ($z = -2.22$, $p < .05$). The difference was even larger for *Educational Track* (GE: 48.48% vs. 70.06%, $z = 3.74$, $p < .001$).

Only a minority (36.08%) found it important to spell verbs correctly in messages to friends. Again, the responses were correlated with *Educational Track*. Almost half of all GE students (48.48%) agreed with the statement vs. only 17.83%, i.e., a clear minority, of all TE students ($z = -5.95$, $p < .001$). The factor *Gender* was not significant ($p = 0.15$). Finally, about half of all participants (i.e., 51.03%) considered verb spelling errors in messages to family members acceptable. *Educational Track* significantly affected the responses: Only 38.10% of the GE students found this acceptable, whereas a clear majority of the TE students (70.06%) had no problems with it ($z = 6.05$, $p < .001$). *Gender* was not significant ($p = 0.074$).

5.2.3 *Perceived rule mastery*

In general, participants did not rate their own rule mastery very high: Only 50.26% considered themselves to have a good command of the verb spelling rules. *Educational Track* played a major role: Significantly more GE students (60.61%) than TE students (35.03%) showed confidence in their own rule mastery ($z = -4.88$, $p < .001$). *Gender* was not significant ($p = 0.99$). Furthermore, 28.87% of all participants agreed with the statement that they often catch themselves making verb spelling errors. Again, the responses were correlated with *Educational Track* (GE: 23.38% vs. TE: 36.94%, $z = 2.87$, $p < .01$). *Gender* played no role ($p = 0.45$). Table 5 gives an overview of the correlations between each statement and the social factors *Educational Track* and *Gender*.

Table 5 Overview of the correlation between *Educational Track* and *Gender* on the one hand and the attitudinal statements on the other hand (+ and – refer to the presence and absence of a significant correlation, respectively)

	Educational track	Gender
Formal contexts		
School tasks: correct spelling important	+	+
School tests: errors acceptable	+	–
Messages to teachers: correct spelling important	+	+
Messages from teachers of Dutch: correct spelling important	+	+
Messages from other teachers: errors acceptable	+	+
Informal contexts		
Messages on WhatsApp/Facebook Messenger: errors acceptable	+	+
Messages to friends: correct spelling important	+	–
Messages to family members: errors acceptable	+	–
Perceived rule mastery		
Good rule mastery	+	–
Catch own errors	+	–

6 Conclusion

By means of a two-part survey, we wanted to investigate the role of *Educational Track* and *Gender* with respect to knowledge of the verb spelling rules (Part I) and spelling attitudes (Part II). In our previous studies on verb spelling errors by adolescents in private social media writing (Surkyn et al., 2020, 2021), we found that fewer errors are made by girls than by boys and by students from theoretically oriented tracks than by their peers in technical education. We argued that the gender difference is most likely related to a difference in spelling attitudes rather than rule knowledge. We assumed that girls attach more importance to correct verb spelling because women tend to be more careful to avoid stigmatized errors (e.g., Tagliamonte, 2011). We attributed the differences between educational tracks to both a better command of the verb spelling rules and a stronger focus on correct spelling (i.e., a stricter spelling attitude) in GE students. Our survey, administered to 451 high school students, allowed us to check the validity of these interpretations.

We found no evidence that gender plays a role in knowledge of verb spelling rules. In simple conjugation exercises boys and girls performed equally well on simple present forms (exercise 1) and past participles (exercise 2). This absence of a gender difference was also observed in participants' perception of their own rule mastery: Boys' and girls' self-assessments did not differ. However, they differed in the importance they attached to correct spelling. In general, girls seem to be less tolerant towards verb spelling errors than boys in both formal and informal writing contexts. We found a significant relationship between gender and the responses for four of the five statements regarding formal situations: the requirement of correct verb spelling in (1) school tasks, (2) messages to teachers, (3) messages from teachers of Dutch, and (4) messages from teachers of other courses. With regard to informal writing situations, significantly fewer girls considered spelling errors on verb forms acceptable in conversations via WhatsApp and Facebook Messenger. Hence, our previous findings that girls make significantly fewer verb spelling errors than boys in chat posts (Surkyn et al., 2019, 2020, 2021) indeed seems to be related to a stronger focus on correct verb spelling on the part of girls.

As hypothesized, our analyses revealed that adolescents in the more theory-oriented tracks of general education have a better knowledge of the verb spelling rules than students in the more-practice oriented tracks of technical education. GE students' performance in the conjugation exercises was significantly more often faultless than that of their TE peers (simple present: 75.32 % vs. 30.18 %; past participle: 74.03 % vs. 38.46 %). The self-assessments on rule mastery indicate that TE students are well aware of their poor command of the verb spelling rules. This is in line with earlier findings, which shows that theoretically oriented students make fewer verb spelling errors in dictation tasks and writing assignments than their peers in more practice-oriented tracks (Van den Bergh et al., 2011; Van der Horst et al., 2012). Still our results are quite striking in view of the fact that the spelling task was less demanding than in these previous studies: The verb spellings were elicited in a most straightforward and simple way. Furthermore, we found clear attitudinal differences between GE and TE students. Both in formal and informal writing contexts, GE students care more about correct spelling than TE students. This was the case for all attitudinal statements. Thus, the survey results are consistent with our earlier interpretation of the role of educational track in verb spelling errors in social media writing: The many errors produced by TE students are related to both a lack of rule knowledge as well as a more tolerant attitude towards verb spelling errors.

We can conclude that the results of this survey confirm our interpretation of the gender and educational differences that we observed in adolescents' online messages (Surkyn et al., 2019, 2020, 2021). Hence, this study provides us with further insight into these earlier attested gender and educational differences since it substantiates conclusions that remained tentative until now.

Moreover, our study shows that many adolescents seem to lack a good command of the verb spelling rules. Only 56.25 % of all 16–20-year-olds were able to complete the simple conjugation exercises on the present tense without mistakes and only 59.00 %

were able to do so in the past participle exercise.[14] Considering the clear-cut spelling rules, the low degree of difficulty of the exercises, and the high educational attention for verb spelling in primary and secondary education, these percentages are remarkably low. This relatively poor rule mastery was accompanied by problems in describing the rules (or a mnemonic) and a low confidence in spelling correctness, which were both correlated with the faultless performance in the exercises on the simple present and past participle. Hence, besides working memory overload (Frisson & Sandra, 2002) and a lack of skill in grammatical analysis (Chamalaun et al., 2021), problems with rule knowledge itself seems to be at the basis of many verb spelling errors by adolescents.

Despite often having poor rule knowledge, the majority of adolescents indicated to care about correct verb spelling in formal writing contexts, i.e., roughly 90% across the five attitudinal statement pertaining to such situations. A recent study of Hilte et al. (2019) also showed that (Flemish) adolescents consider standard language use, which includes correct spelling, important in formal communicative situations, even though they do not think of themselves as having a high standard language proficiency. Note that adolescents' attitudes were measured by means of a self-report task, both in Hilte et al. (2019) and the current study. Hence, the responses might be influenced by social desirability effects (see e.g., Anderson, 2019; Fazio et al., 1995; Mitchell & Tetlock, 2015): The school context might stimulate the students to pay lip service to the predominant classic standard language ideology (see also Hilte et al., 2019).

In this study we made an explicit distinction between (1) participants' knowledge of the verb spelling rules for the simple present and the past participle and (2) their attitudes towards errors against these rules. The simple and straightforward design of the survey leaves no room for ambiguity: We cannot but conclude that about half of the adolescents in the final two years of secondary education simply do not master the rules. While the present study is restricted to specific verb spelling rules and consequently does not allow for generalizations with respect to the overall spelling practices of these youngsters, this might serve as a wake-up call for teachers and educationalists. With respect to the social variables, we conclude that theoretically oriented students have a better knowledge, whereas no evidence was found that boys and girls differ in terms of rule knowledge. In spite of poor spelling achievement for these particular verb spelling tasks, most adolescents (± 90%) consider correct verb spelling important in formal writing contexts. However, error tolerance is much higher in informal contexts (± 50%). The latter may partly explain the high frequency of verb spelling errors in Flemish adolescent social media writing (see Surkyn et al., 2020, 2021), but the present study reveals that rule mastery definitely is an issue too. Finally, there is a correlation between spelling attitudes and social profile: Theoretically oriented students attach more importance to correct verb spelling, both in formal and informal writing contexts. Girls consider correct verb spelling more important than boys in formal writing contexts and in messages on WhatsApp and Facebook Messenger.

Acknowledgements

We thank the three anonymous reviewers for their helpful and constructive feedback on the previous versions of this paper.

Notes

1 When the verb precedes the subject (inversion, for instance, in question forms), the 2nd person singular is formed in the same way as the 1st person singular. So in this case no ⟨t⟩ is added to the stem (e.g., *Vind je?*, 'You think?').

2 This relation between individuals' exposure to printed texts and their quality of orthographic representations has been studied, for instance, in experimental research on orthographic learning and spelling errors in particular (see, for example, Falkauskas & Kuperman, 2015; Rahmanian & Kuperman, 2019; Rossi et al., 2019).

3 The survey also included a third exercise in which the participants had to spell the imperative of three verbs. As only two imperatives caused errors (the third was spelled as it sounds), we will not report the data from such a small sample.

4 Note that the Dutch verb *gebeuren* ('to happen') is an impersonal verb, which means it always takes a third person singular inflection. We alternated the subject (*het*, *dat*, *er*: three impersonal pronouns), forcing the participants to note three (albeit identical, i.e., third person singular) forms for this verb as well.

5 If the stem-final letter is already a /t/, no additional ⟨t⟩ is added (e.g., *jij pest*, 'you bully').

6 *BSO* or *PE* stands for professional or vocational education (*beroepssecundair onderwijs*) and is one of the three main educational tracks in Flemish secondary education. This track prepares for direct access to the job market, primarily for manual labor.

7 The ethical committee for the Social Sciences and Humanities of the Antwerp University gave their clearance for the data collection of the doctoral research of which this study is a part.

8 Some participants did not identify themselves as male or female but chose the x-symbol. They were removed because this sample was too small (n = 17) for a separate analysis.

9 Participants with dyslexia were excluded from the analyses as dyslexia is a potential confounding factor. In addition, this group was far too small (~5%) to warrant the inclusion of a factor *Speller Type* in the regression equation.

10 In all our analyses, a forward stepwise procedure (i.e., the approach taken in our previous studies, see Surkyn et al., 2020, 2021), yielded the same final model as the backward stepwise procedure described above.

11 We did not include the interaction terms in the initial model because a model including all main effects and all interaction terms would be too large for the size of our data set.

12 Since participation in the survey was anonymous, we did not obtain any information on the school class (ID) of the students (i.e., which pupils belong to the same school class). As a consequence, we could not include school class as a random factor in the model.

13 The GVIF values were normalized, taking the degrees of freedom into account, with the formula GVIF^(1/(2*df) (see Fox & Monette, 1992).

14 Recall that there are huge differences between GE and TE students.

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