

## Article

# Exploring the Effects of Early Extramural English Exposure on the Vocabulary Size of University Students

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**Abstract:** Research has shown that current informal extramural (out-of-class) activities can be an important predictor of second language (L2) vocabulary knowledge, but less is known about the relationship between language proficiency and activities earlier in life, which could have contributed to L2 acquisition. This exploratory study investigated Norwegian university students' reported exposure to English through extramural activities at an early age and how this related to their current vocabulary size in L2 English. Participants (N = 40) completed an online survey comprising items from the Vocabulary Size Test (VST) and questions about the earliest extramural activity they felt made an important contribution to their knowledge of L2 English and the age at which they engaged in this activity. Participants' mean English vocabulary size, as measured by the VST, was 11,246 words, and regression analysis found that the age of reported earliest extramural exposure was a significant predictor for L2 vocabulary size but that the current age of participants was not a significant predictor of VST scores. The results suggest that investigating early exposure to extramural input could be an important avenue for future research.

**Keywords:** extramural English; L2 acquisition; vocabulary acquisition; age of onset



**Citation:** Busby, N.L. Exploring the Effects of Early Extramural English Exposure on the Vocabulary Size of University Students. *Educ. Sci.* **2024**, *14*, 372. <https://doi.org/10.3390/educsci14040372>

Academic Editor: Barry Lee Reynolds

Received: 28 February 2024

Revised: 22 March 2024

Accepted: 1 April 2024

Published: 4 April 2024



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## 1. Introduction

Acquisition of a second language (L2), especially English, through exposure outside of the language classroom, has been the subject of increased interest in recent years. This type of language input is often referred to as extramural (i.e. outside the walls of the classroom [1,2]) exposure in the Scandinavian context. A variety of other terms have been used in different contexts for informal language learning outside the language classroom, including 'out-of-school exposure', e.g. [3], and terms which are more specific to digital contexts such as Online Informal Learning of English (OILE) [4], and 'digital wilds' [5]. The terms 'extramural exposure' and 'extramural English' refer to any type of voluntary, self-initiated activity, including but not limited to digital contexts, where English is encountered outside of a formal education context [6]. Studies investigating language acquisition from input outside the classroom have found significant associations between measures of L2 proficiency and the quantity or frequency of input from various extramural activities such as watching TV shows [7–11], reading [12–14], playing digital games [15–19], and online reading/social media [3,7,20]. Studies have shown that in some contexts, extramural input seems to be a better predictor of L2 vocabulary knowledge than time spent in formal L2 education settings [3,13,14].

One of the potential explanations for extramural input having a greater impact than classroom instruction can simply be the amount of time available for exposure. The time available for exposure to language in formal instruction settings is often much more limited than for extramural activities [21,22] and studies have shown that the amount of input in education settings, especially in the first years of school, may not be enough to have any measurable impact on L2 acquisition [23]. Motivation is also likely to play a role and engaging in extramural activities for the sake of the activity rather than language learning

means that incidental language acquisition can take place regardless of an individual's attitude towards or intention to learn a language. Incidental language acquisition occurs while learners are focused on understanding meaning rather than on conscious language learning [24], for example, 'picking up' words from reading or hearing them without the conscious intention to memorise them [25,26]. Incidental learning is often contrasted with intentional learning, although encountering a word incidentally can often lead to a more intentional exploration of the word's meaning [24]. Incidental acquisition can occur both inside and outside of classroom settings and seems to be a particularly important mechanism for younger language learners [27]. Incidental learning can be particularly relevant for vocabulary acquisition since new words need to be encountered multiple times before they become part of a learner's vocabulary [28,29], and a large L2 vocabulary is unlikely to be learned from explicit vocabulary instruction alone [25].

Studies investigating extramural exposure among young language learners are rarer than those focusing on older learners [21], but studies have also demonstrated a clear link between extramural activities and aspects of L2 proficiency among children and adolescents [10,20,30,31]. In contexts like Belgium, where English education begins in secondary school, young language learners have an impressive knowledge of English gained from outside the classroom before they have begun formal instruction [3,20,32], and in a study by De Wilde and Eyckmans [33], 40% of the 11-year-old Belgian participants were found to have already met the competence goals of the first years of English classes prior to beginning instruction.

The majority of studies investigating the effects of extramural input are cross-sectional, meaning that they look at relationships between L2 proficiency and extramural activities that learners report engaging in at the time of the study. However, since studies have shown an impact of extramural English at various ages, it also seems reasonable to assume that activities that learners have undertaken earlier in life would also likely have had an impact on their L2 proficiency. There have been few longitudinal studies conducted on extramural English and aspects of L2 English proficiency (although see [34], for an exception). Still, previous research has shown that other factors relevant to language acquisition, such as motivation, can vary over time, e.g., [35], and it seems reasonable to assume that opportunities for exposure to extramural English would also likely vary over time. However, little is known about the impact of extramural activities earlier in life on the L2 vocabulary size of adults. The current study aims to investigate how well young adults are able to recall extramural English activities from childhood and whether the age at which these activities took place (to their recollection) was associated with their current L2 vocabulary size. This may be particularly interesting given that learners with higher L2 proficiency have been shown to be better at understanding and acquiring new vocabulary than those with lower L2 proficiency [34,36]. Therefore, if some individuals obtain a 'head start' at learning English, it could lead to even greater gains later on.

### 1.1. The Current Study

The context for the current study is Norway, where English plays an important role in society despite not being an official language. English is present in daily life in Norway and most Norwegians are also extensively exposed to English through the media. It has been said that 'English no longer feels *foreign* to Norwegians' [37] (p. 1). Norwegians are consistently shown to be among the most proficient users of English as a second language in the world [38]. English is taught in schools from the first grade (age 6), and the common origins and many cognates between English and Norwegian likely give Norwegians some advantages when learning English, see [39] since studies have shown that cognates can help learners understand and acquire new vocabulary [8,10,40–42].

Many young Norwegians encounter English in their daily lives, with a survey from 2022 revealing that around 70% of 9–18-year-olds reported that English was the main language for online videos, television shows, movies, and gaming [43]. Significant relationships between exposure to extramural English activities and L2 knowledge have

been demonstrated in different age groups in Norway. Busby [13] found that extramural activities such as reading and gaming were significant predictors of L2 English vocabulary knowledge among university students. Brevik and Hellekjær [44] found that Norwegian upper secondary students who reported spending a lot of time gaming in English had higher scores on tests of reading proficiency in L2 English than they did in L1 Norwegian. Several master's theses have found significant relationships between extramural English activities, especially gaming, and L2 English vocabulary knowledge among upper [45] and lower—[46,47] secondary school pupils in Norway. Estensen [48] investigated L2 English vocabulary among primary school pupils and found that vocabulary test scores were higher for pupils who engaged in extramural activities frequently compared to those who did fewer activities in English. Kalhagen [49] found that even pupils in the first grade of school in Norway engage in extramural activities in English, although her sample size was too small to determine whether this had a significant effect on their vocabulary.

Although previous studies have demonstrated significant connections between L2 vocabulary knowledge and extramural L2 activities that participants report undertaking at the time the research is taking place, language learning clearly takes place over a long period of time, and reports of current activities may not give a good overall picture of other activities that participants may have undertaken earlier in life that have also contributed to language acquisition. For example, participants who may have been enthusiastic gamers in high school may find that they no longer have time for computer games as university students. Longitudinal studies are very valuable in understanding more about this topic but are time-consuming and resource-intensive to conduct and, consequently, rarely able to follow individuals from early childhood to university. The current exploratory study seeks to investigate whether participants' reported memories of early extramural English activities can also shed light on the relationship between activities in childhood and L2 vocabulary knowledge in early adulthood.

### 1.2. Research Questions

1. How do participants perceive the relative contributions of formal English education and extramural English to their current knowledge of English?
2. Are participants able to recall early extramural English activities, what types of activities do they report, and at what age did these occur?
3. Is L2 English vocabulary size associated with the reported age of earliest extramural English activity for these participants?

## 2. Materials and Methods

The present study used an online survey to investigate early English activities and current English vocabulary knowledge among Norwegian university students. The project was registered with the Norwegian Agency for Shared Services in Education and Research.

### 2.1. Participants and Procedure

Participants for this study (N = 40; 28 female, 11 male, and one who did not specify gender) were students in a Norwegian university who were enrolled in a course in the English program. The mean age of participants was 23 years (range: 20 to 33). Norwegian was the first language of all participants, and 3 participants reported that they had another first language in addition to Norwegian. None of the participants reported having English as a first language.

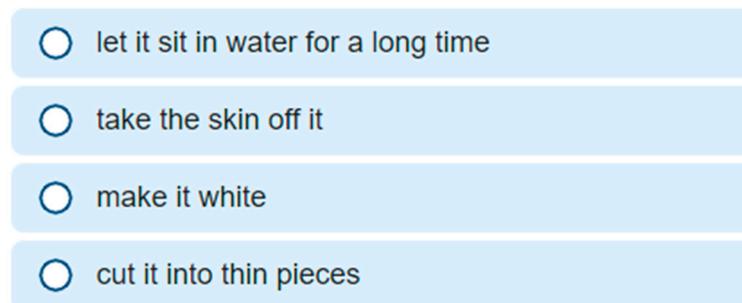
Data were collected using an online survey comprising questions about participants' early experience with extramural English and questions from the Vocabulary Size Test (VST) [50]. Participants were informed about the study by the researcher (who was also the lecturer) in their lecture time and were directed to a link to the online survey via their course webpage.

Participants were asked to report, using 10-point scales, how important they considered formal education and out-of-class activities to have been to their current knowledge

of English. They were then asked to name or describe the earliest out-of-school activity that they felt made an important contribution to their current knowledge of English. They were asked to classify this activity (e.g., book or movie) and report the approximate age they remember first engaging in this activity. They were also asked to rate their agreement with statements (reported in Section 2) about extramural activities on a 5-point Likert-type scale (strongly agree–strongly disagree).

The VST was used in this study to give an indication of participants' written receptive vocabulary size. The test is based on word frequency lists taken from the British National Corpus [50] and samples ten words from every thousand-word frequency band using a multiple-choice meaning-recognition format with 4 possible options (see Figure 1). Although the multiple-choice format is potentially vulnerable to guessing or other test-taking strategies, e.g., [51], it can nevertheless be a useful tool in this context since it encourages participants to pick the most likely option based on the resources they have available to them, including partial knowledge or recognition of cognates, which is relevant when investigating vocabulary acquisition through incidental learning. It should be noted that there are limitations inherent in the design of the VST, such as the small sampling rate [52] and the fact that the test is based on word families rather than lemmas, which may give more accurate estimates of vocabulary size [53,54], and therefore, vocabulary size estimates based on this test should be interpreted with caution.

### PEEL: Shall I peel it?



let it sit in water for a long time

take the skin off it

make it white

cut it into thin pieces

**Figure 1.** An example question from the VST.

Since previous research [13] found that university students in Norway enrolled in English programs demonstrated a high level of mastery of the most frequently occurring 5000 words in English, only the items from the 5000 level of the VST and up to the maximum of 14,000 words were included in the current study in order to reduce participant fatigue and increase chances of completion of the survey. It should be noted that this may have impacted the accuracy of the vocabulary size estimate, but the main aim of using VST scores in the current study was to investigate relationships with regard to various predictor variables rather than to accurately measure vocabulary size per se.

## 2.2. Analysis

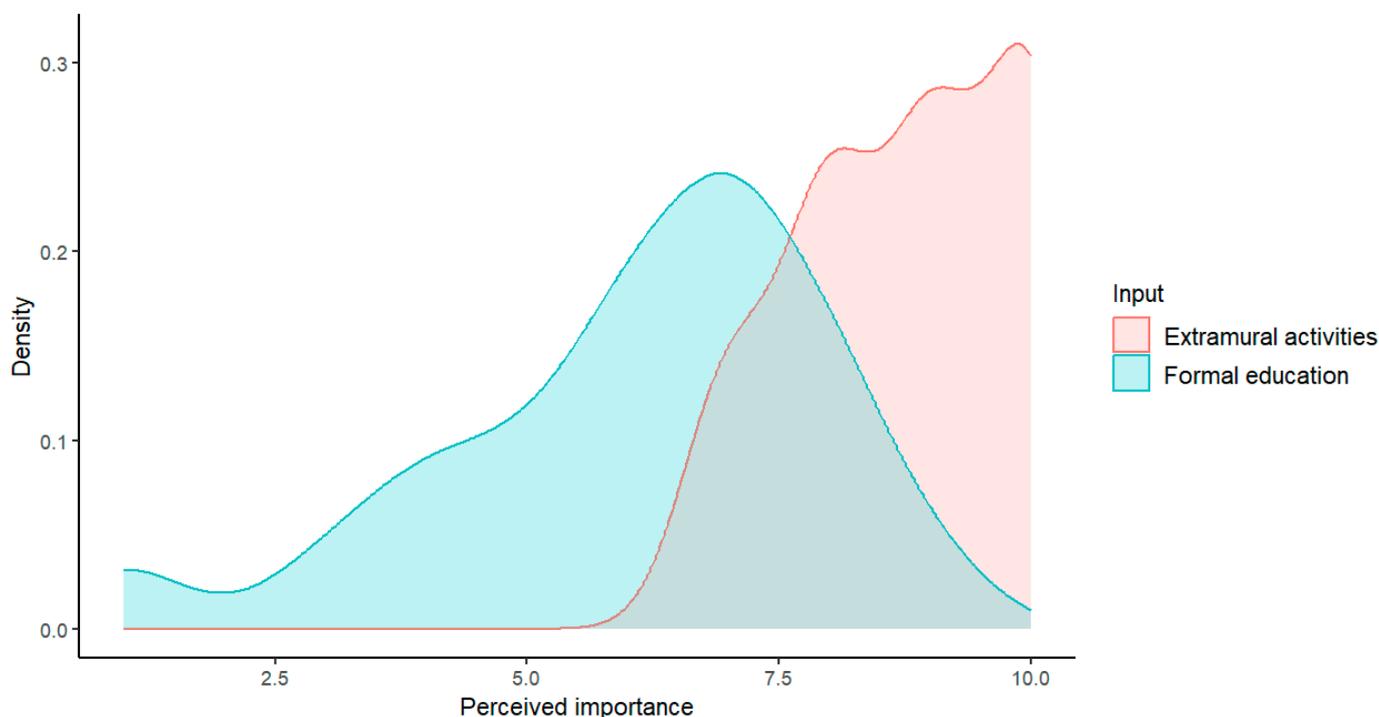
Vocabulary size, as measured by the VST, as well as responses to the questions about perceived contribution of formal and informal learning, are reported using descriptive statistics. Current age and the age of reported early extramural activity were investigated as possible predictors of current vocabulary size (as the dependent variable) using regression analysis. All analyses and visualizations were completed in R Version 4.2.2 [55].

## 3. Results

### **RQ1: How do participants perceive the relative contributions of formal English education and extramural English to their current knowledge of English?**

Overall, participants reported feeling that extramural activities had made a greater contribution to their English than formal education. The mean rating out of 10 for formal

education was 6.07, and the mean for extramural activities was 8.78. As shown in Figure 2, it is interesting to note that there was a much greater range for the formal education responses (min: 1, max: 10) compared to extramural activities (min: 7, max: 10), suggesting that perceived experiences of learning benefits from formal L2 English education can be very variable contrasted with extramural activities, which all participants considered to have made an important contribution.



**Figure 2.** Density plot showing participants’ perception of the contribution of formal education and extramural activities to their knowledge of English.

Participants also reported perceiving that extramural activities had played an important role in contributing to their current knowledge of English and that engaging in extramural activities early in life had enabled or encouraged them to engage in more activities in English later. See Table 1 for details.

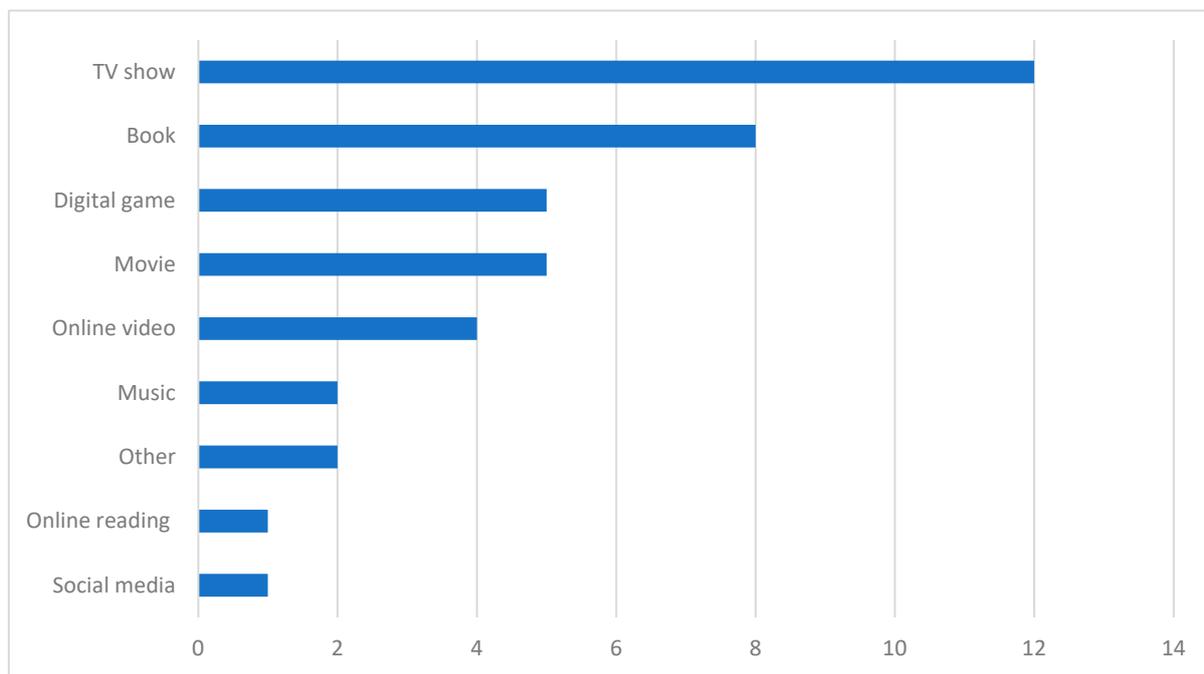
**Table 1.** Participants’ responses to statements about experiences with extramural English.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Extramural activities at an early age enabled/encouraged me to do more extramural activities later	21	16	3	0	0
I feel that extramural activities have contributed to my knowledge of English vocabulary	36	4	0	0	0

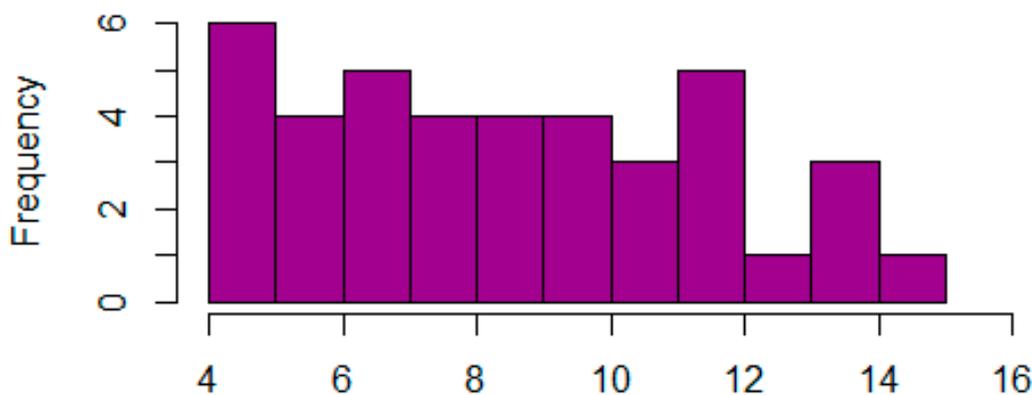
**RQ2: Are participants able to recall early extramural English activities, what types of activities do they report, and at what age did these occur?**

All participants reported specific extramural activities that they remembered learning English from early in life. Some examples were watching TV shows in English or reading books like the *Harry Potter* series. Participants were asked to select a category that their activity belonged to, and watching TV shows and movies, reading books, and playing digital games were the most frequently reported categories of activities remembered from

childhood (see Figure 3). The age at which participants reported first engaging in these activities ranged from 4 to 15 years old (mean = 8.8) and can be seen in Figure 4.



**Figure 3.** Number of participants reporting each category of extramural activity as the earliest activity they believed to make an important contribution to their current knowledge of English.

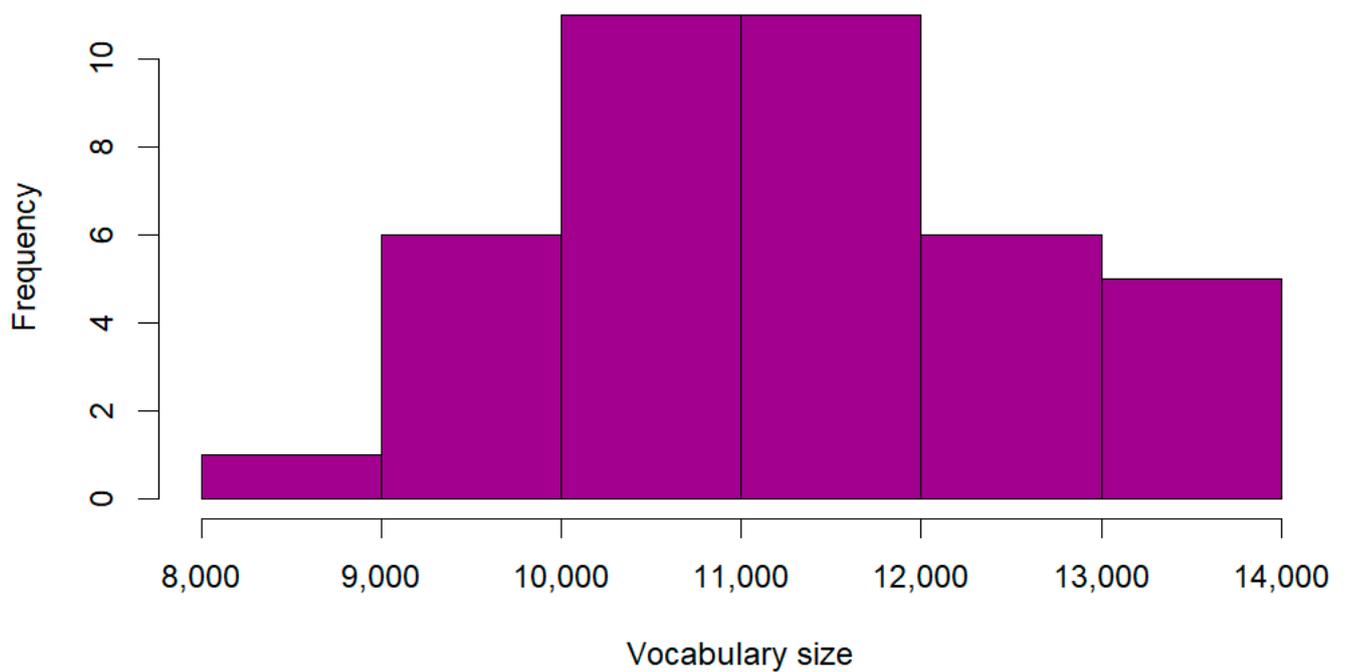


**Figure 4.** Histogram of age of earliest reported extramural activity in English.

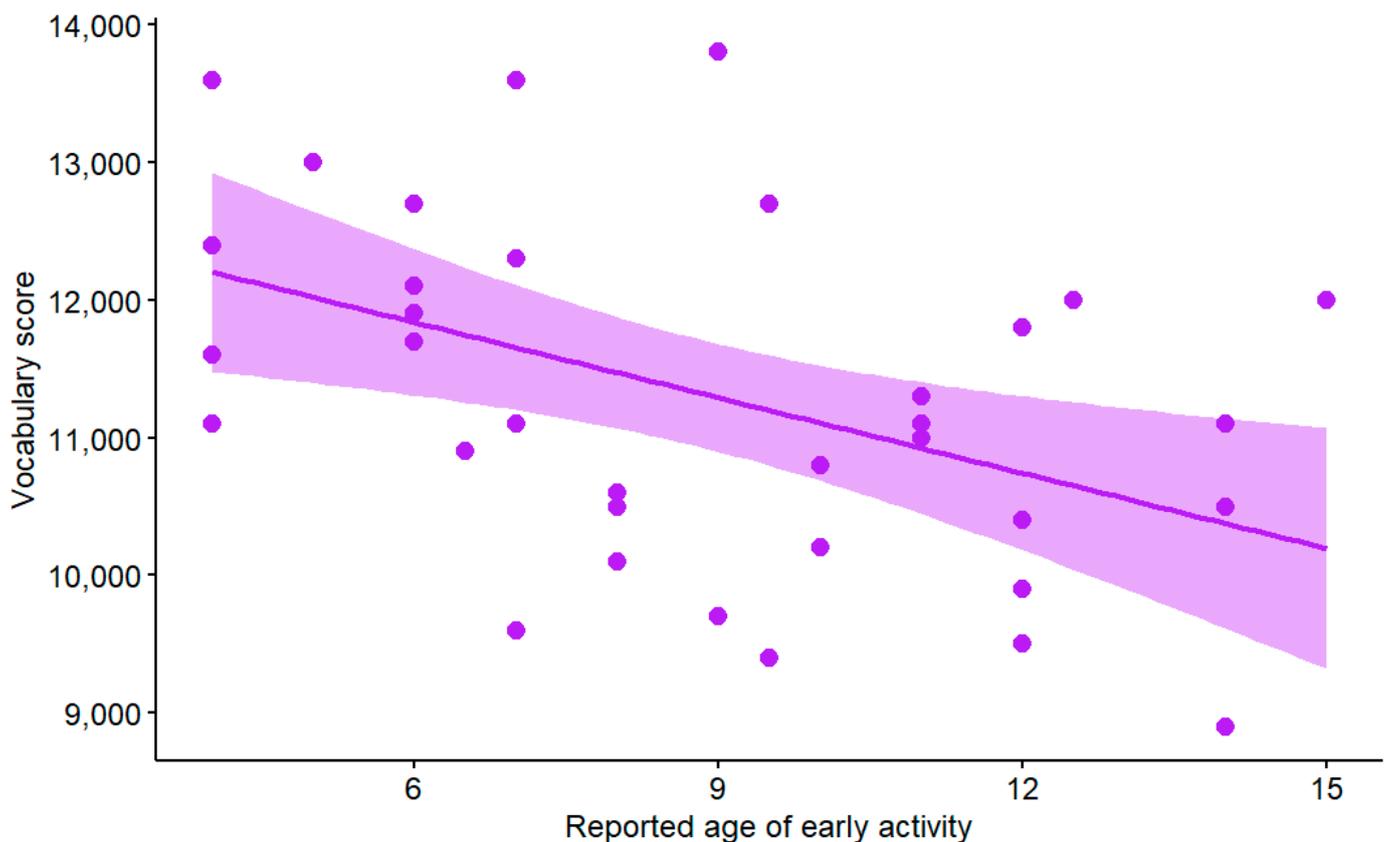
**RQ3: Is L2 English vocabulary size associated with the reported age of earliest extramural English activity?**

The mean estimated vocabulary size for participants in this sample was 11,323 words (min: 8900; max: 13,800). Figure 5 shows the distribution of the vocabulary scores and indicates that scores approximately followed a normal distribution within this range.

A simple linear regression analysis was conducted to investigate whether the reported age of earliest extramural English activity was a predictor of current vocabulary size for this group of university students. As represented in Figure 6, the age of starting activities in English was negatively associated with current vocabulary size as measured by the VST scores, meaning that an earlier reported starting age of extramural English activities was significantly associated with a larger vocabulary size at the time of the study ( $R^2 = 0.18, p = 0.005$ ).



**Figure 5.** Histogram of L2 English vocabulary size of participants as measured by the VST.



**Figure 6.** Vocabulary size (VST score) and reported age of earliest extramural English activity.

A measure of 'extramural exposure time' was calculated by subtracting the age of the reported earliest extramural English activity from each participant's current age at the time of the study. Additional simple linear regression models were conducted to investigate whether this exposure time variable or participants' current age were predictors of VST

scores. These models were calculated separately to minimise issues with collinearity. The measure of extramural exposure time was found to be a significant predictor of vocabulary size ( $R^2 = 0.16$ ,  $p = 0.009$ ). The current age of participants was not found to be a significant predictor of vocabulary size ( $R^2 = 0.017$ ,  $p = 0.419$ ).

It should be noted that although both the starting age of extramural activities and the 'extramural exposure time' measure were significantly related to VST scores, the effect sizes were relatively small, and therefore, results should be interpreted with appropriate caution.

#### 4. Discussion

Findings from this exploratory study suggest that L2 English vocabulary size among university students could be related to the starting age of extramural English activities in childhood. The study aimed to investigate whether university students could remember specific extramural English activities from childhood, the extent to which they considered extramural activities to have contributed to their current knowledge of English, the age at which they remember engaging in the earliest of these activities, and whether there was any association between the age of starting the activities and their current L2 English vocabulary size. Participants were all able to identify and describe a specific extramural English activity from childhood that they felt made an important contribution to the English they know today, and the age at which they reported engaging in this activity was shown to be a significant predictor for vocabulary size as measured by the VST. This study also highlights the importance of investigating language acquisition opportunities over the lifetime since it shows the variation in starting age for extramural activities (see Figure 4).

In line with previous research [13], this study found relatively high variation in L2 English vocabulary knowledge among Norwegian university students (from 8,900 to 13,800 words, meaning the lower-scoring participants had only 65% of the vocabulary scores of the highest-scoring participants), even though all participants were enrolled in English classes at university and likely have a relatively similar background in terms of formal education in English. The mean vocabulary size for this sample was 11,323 words, which is reasonably high for L2 users and reflects the generally high English proficiency in Norway [38]. Similar to findings from previous research in the Norwegian context [13,44], it is likely that extramural activities played a very important role in L2 vocabulary acquisition since a vocabulary size this large is unlikely to have been developed in formal education contexts alone. Participants also reported perceiving that extramural input had played a very important role in contributing to their knowledge of English (see Figure 2).

The current study found that the age at which participants reported engaging in their earliest extramural English activities was a significant predictor of their L2 English vocabulary size as university students, which is in line with previous research showing that age of onset is an important predictor of L2 acquisition, e.g., [56]. Participants' current age was not a significant predictor of vocabulary size, despite the implication that being older would mean more potential time for exposure to English input, although this could be a result of a small sample and limited age range of participants (20–33), as well as reflecting the probable variation in the quality and quantity of input over time. It could also reflect a generational shift in access to English-language resources via the Internet (see [57], p. 246 for a discussion). Previous studies have found significant relationships between measures of L2 English proficiency and the amount of extramural English children are exposed to at the time of the study [10,20,30,31], but the current study highlights the importance of looking at exposure to language over the lifetime and findings suggest that these early experiences with extramural English can also affect vocabulary size much later in life (discussed in more detail below). Of course, this approach of asking participants for self-reports of early memories clearly has limitations in terms of accuracy of reporting since memory is not always reliable (see [58] for a review), but it is interesting to see the variation in age reported and that there was a significant relationship with current vocabulary size, even if the effect size was not large.

Participants reported that both formal and extramural activities had contributed to their knowledge of English, but the perceptions of the contributions of formal education were much more varied, with some reporting feeling that formal education had contributed very little to their knowledge of English. Although these are perceptions, and it is difficult to know the extent to which they reflect reality, this discrepancy could reflect the difference in the amount of time available for extramural exposure compared to time in the classroom. Norwegian university students would typically have received up to 700–1000 h of English education in school [59], which equates to slightly more than 1 h a week, on average, but the time available for extramural activities during the same 13 years may have been much higher for many. There is also some evidence that the initial years of formal English education in Norway do not necessarily provide enough input to make a difference in vocabulary development [23]. The limited time available for teaching and the fact that many pupils may have already gained a level of English proficiency from extramural activities that was higher than expected for their age (see also [33]) could help to explain the variable perception of the contribution of formal English education.

Having an introduction to English through school probably helped with understanding English that participants encountered extramurally, but it should be noted that several participants reported engaging in extramural activities at age 4 or 5, which is before the age at which formal English education begins in Norway. Studies from Flanders, Belgium, where formal English instruction begins at age 12–13, have shown that young learners appear to acquire a lot of English extramurally before they encounter it in school [3,20,33]. Since this study and many others showing a strong contribution of extramural English (especially prior to significant amounts of formal English education) come from contexts where the majority language is related to English, such as Sweden [17], Denmark [31], and Flanders [3,20], it is likely that linguistic similarity and cognate facilitation effects can be helpful for learners in developing an initial understanding of English they hear or read [10]. Cognates have been shown to be particularly helpful in incidental learning and understanding words from context [8].

The age range over which participants reported engaging in their earliest extramural English activities was quite variable (4–15 years). Again, it should be noted that these are reported memories from childhood so there are limitations to the accuracy of this as a measure. Also, participants were asked to report on activities that they believed to be important for contributing to their English, and therefore, the reported activities do not necessarily reflect the ages of the very first activities in English but perhaps rather the first significant and memorable ones. With these limitations in mind, it is nevertheless interesting to note the variation in the reported starting age of these activities, and this finding also highlights the importance of looking at these activities over the lifetime. Longitudinal studies such as those by Muñoz [35] have contributed valuable information about language learning trajectories and how aspects like motivation and aptitude vary over time. Clearly, the types of extramural activities that people engage in also vary considerably and, consequently, should be investigated to help with understanding vocabulary development since looking at a single point in time or even using a limited longitudinal study would not necessarily give a complete picture.

Almost all participants agreed with the statement that extramural activities at an early age enabled and/or encouraged them to engage in more extramural activities later, and the relationship between the starting age of extramural English activities and current vocabulary size suggests that this may be a factor. Studies have shown that more proficient L2 learners have better chances of acquiring new L2 vocabulary than learners with lower proficiency [34,36], so it is possible that obtaining an early start with extramural English could lead to compound vocabulary growth (a Matthew effect, see [60]). In a study of Belgian children before they had received any formal English instruction, De Wilde and Eyckmans [33] found a bimodal distribution in English proficiency, which suggested that some children had very little knowledge of English prior to instruction and children who engaged in extramural English activities knew quite a bit. It is interesting to consider

whether chance encounters with stories or materials in English can have cumulative effects that result in further engagement in activities in L2 English.

It is worth noting that the participants in this study were students in an English course, which means results from this sample are not necessarily generalisable to all Norwegian university students. While previous research [13] has shown that English students in Norway do not necessarily demonstrate higher English proficiency than students in other study programs, for some students at least, the early formative experiences they had with extramural English may have helped to develop an interest in English that led them to their current field of study. Therefore, it would be interesting to compare results from students in other fields of study to see whether they also had memorable early experiences with extramural English. More in-depth investigations into this topic could also include measures of quality and quantity of input as well as whether different types of input (for example, written or audio–visual) might be associated with different types of language outcomes later in life. It would also be interesting to explore in more depth whether there is a relationship between previous and current extramural activities to see whether starting early with extramural English leads to more activities in English later in life. A longitudinal study would obviously also be very valuable for investigating this and would mitigate some of the problems with a memory-based study, although it could still be subject to bias in terms of who might decide to participate and also to remain in the study throughout.

## 5. Conclusions

This study found that university students were able to remember specific activities from childhood that they felt contributed to their knowledge of L2 English, and the age at which these activities took place was significantly associated with their current L2 English vocabulary size. Although reported memories from childhood have limited reliability, this study highlights the importance of discussing the impact of cumulative exposure to L2 input when considering the relationship between extramural exposure and L2 vocabulary knowledge. Exploring early extramural English exposure is important for our understanding of L2 acquisition and also has direct implications for language teachers who need to understand the diversity of prior knowledge that learners bring with them to the classroom.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki and approved by the Norwegian Agency for Shared Services in Education and Research (577432 approved 15 September 2023).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author.

**Conflicts of Interest:** The author declares no conflicts of interest.

## References

1. Sylvén, L.K. How is extramural exposure to English among Swedish school students used in the CLIL classroom. *IEWS–Vienna Engl. Work. Pap.* **2006**, *15*, 47–53.
2. Sundqvist, P. Extramural English Matters: Out-of-School English and Its Impact on Swedish Ninth Graders' Oral Proficiency and Vocabulary. Ph.D. Thesis, Karlstad University, Karlstad, Sweden, 2009.
3. Peters, E.; Noreillie, A.S.; Heylen, K.; Bulté, B.; Desmet, P. The impact of instruction and out-of-school exposure to foreign language input on learners' vocabulary knowledge in two languages. *Lang. Learn.* **2019**, *69*, 747–782. [[CrossRef](#)]
4. Sockett, G. *The Online Informal Learning of English*; Springer: New York, NY, USA; Palgrave Macmillan: London, UK, 2014.
5. Sauro, S.; Zourou, K. What are the digital wilds? *Lang. Learn. Technol.* **2019**, *23*, 1–7.
6. Sundqvist, P.; Sylvén, L.K. *Extramural English in Teaching and Learning: From Theory and Research to Practice*; Palgrave Macmillan: London, UK, 2016.
7. Peters, E. The effect of out-of-class exposure to English language media on learners' vocabulary knowledge. *ITL—Int. J. Appl. Linguist.* **2018**, *169*, 142–168. [[CrossRef](#)]

8. Peters, E.; Webb, S. Incidental vocabulary acquisition through viewing L2 television and factors that affect learning. *Stud. Second. Lang. Acquis.* **2018**, *40*, 551–577. [CrossRef]
9. Puimège, E.; Peters, E. Learning L2 vocabulary from audiovisual input: An exploratory study into incidental learning of single words and formulaic sequences. *Lang. Learn. J.* **2019**, *47*, 424–438. [CrossRef]
10. Lindgren, E.; Muñoz, C. The influence of exposure, parents, and linguistic distance on young European learners' foreign language comprehension. *Int. J. Multiling.* **2013**, *10*, 105–129. [CrossRef]
11. Puimège, E.; Peters, E. Learning formulaic sequences through viewing L2 television and factors that affect learning. *Stud. Second. Lang. Acquis.* **2020**, *42*, 525–549. [CrossRef]
12. González Fernández, B.; Schmitt, N. How much collocation knowledge do L2 learners have? *ITL—Int. J. Appl. Linguist.* **2015**, *166*, 94–126. [CrossRef]
13. Busby, N.L. Words from where? Predictors of L2 English vocabulary among Norwegian university students. *ITL—Int. J. Appl. Linguist.* **2021**, *172*, 58–84. [CrossRef]
14. Warnby, M. Receptive academic vocabulary knowledge and extramural English involvement—Is there a correlation? *ITL—Int. J. Appl. Linguist.* **2022**, *173*, 120–152. [CrossRef]
15. Coxhead, A.; Bytheway, J. Learning vocabulary using two massive online resources: You will not blink. In *Language Learning beyond the Classroom*; Nunan, D., Richards, J.C., Eds.; Routledge: New York, NY, USA, 2015; pp. 65–74.
16. Sylvén, L.K.; Sundqvist, P. Gaming as extramural English L2 learning and L2 proficiency among young learners. *ReCALL* **2012**, *24*, 302–321. [CrossRef]
17. Sundqvist, P.; Wikström, P. Out-of-school digital gameplay and in-school L2 English vocabulary outcomes. *System* **2015**, *51*, 65–76. [CrossRef]
18. Brevik, L.M. The gaming outliers. In *Educational Technology and Polycontextual Bridging*; Elstad, E., Ed.; Sense Publishers: Rotterdam, The Netherlands, 2016; pp. 39–61.
19. Sundqvist, P. Commercial-off-the-shelf games in the digital wild and L2 learner vocabulary. *Lang. Learn. Technol.* **2019**, *23*, 87–113.
20. De Wilde, V.; Brysbaert, M.; Eyckmans, J. Learning English through out-of-school exposure. Which levels of language proficiency are attained and which types of input are important? *Biling. Lang. Cogn.* **2019**, *23*, 171–185. [CrossRef]
21. Peters, E. The Golden Age of Foreign Language Learning: Age and Language Learning Beyond the Classroom. In *The Routledge Handbook of Language Learning and Teaching beyond the Classroom*; Reinders, H., Lai, C., Sundqvist, P., Eds.; Routledge: London, UK, 2022; pp. 112–125.
22. Muñoz, C. Symmetries and asymmetries of age effects in naturalistic and instructed L2 learning. *Appl. Linguist.* **2008**, *29*, 578–596. [CrossRef]
23. Dahl, A.; Vulchanova, M.D. Naturalistic acquisition in an early language classroom. *Front. Psychol.* **2014**, *5*, 329. [CrossRef]
24. Webb, S. Incidental vocabulary learning. In *The Routledge Handbook of Vocabulary Studies*; Webb, S., Ed.; Routledge: London, UK, 2019; pp. 225–239.
25. Grabe, W. *Reading in a Second Language: Moving from Theory to Practice*; Cambridge University Press: Cambridge, UK, 2009.
26. Hulstijn, J.H. Incidental learning in second language acquisition. In *The Encyclopedia of Applied Linguistics*; Chapelle, C.A., Ed.; Wiley–Blackwell: New York, NY, USA, 2013; Volume 5, pp. 2632–2640.
27. DeKeyser, R.M. Age in learning and teaching grammar. In *The TESOL Encyclopedia of English Language Teaching*; Wiley & Sons: Hoboken, NJ, USA, 2018; pp. 1–6. [CrossRef]
28. Horst, M.; Cobb, T.; Meara, P. Beyond a clockwork orange: Acquiring second language vocabulary through reading. *Read. A Foreign Lang.* **1998**, *11*, 207–223.
29. Saragi, T.; Nation, I.S.P.; Meister, G.F. Vocabulary learning and reading. *System* **1978**, *6*, 72–78. [CrossRef]
30. Sundqvist, P.; Sylvén, L.K. Language-related computer use: Focus on young L2 English learners in Sweden. *ReCALL* **2014**, *26*, 3–20. [CrossRef]
31. Hannibal Jensen, S. Gaming as an English language learning resource among young children in Denmark. *CALICO J.* **2017**, *34*, 1–19. [CrossRef]
32. Puimège, E.; Peters, E. Learners' English vocabulary knowledge prior to formal instruction: The role of learner-related and word-related variables. *Lang. Learn.* **2019**, *69*, 943–977. [CrossRef]
33. De Wilde, V.; Eyckmans, J. Game on! Young learners' incidental language learning of English prior to instruction. *Stud. Second. Lang. Learn. Teach.* **2017**, *7*, 673–694. [CrossRef]
34. De Wilde, V.; Brysbaert, M.; Eyckmans, J. Young learners' L2 English after the onset of instruction: Longitudinal development of L2 proficiency and the role of individual differences. *Biling. Lang. Cogn.* **2021**, *24*, 439–453. [CrossRef]
35. Muñoz, C. Tracing trajectories of young learners: Ten years of school English learning. *Annu. Rev. Appl. Linguist.* **2017**, *37*, 168–184. [CrossRef]
36. Elgort, I.; Warren, P. L2 vocabulary learning from reading: Explicit and tacit lexical knowledge and the role of learner and item variables. *Lang. Learn.* **2014**, *64*, 365–414. [CrossRef]
37. Rindal, U.E. Meaning in English: L2 Attitudes, Choices and Pronunciation in Norway. Ph.D. Thesis, University of Oslo, Oslo, Norway, 2013.
38. Education First. Global Ranking of Countries and Regions. Available online: <https://www.ef.com/wwen/epi/> (accessed on 20 February 2024).

39. Schepens, J.J.; Van der Slik, F.; Van Hout, R. L1 and L2 distance effects in learning L3 Dutch. *Lang. Learn.* **2016**, *66*, 224–256. [[CrossRef](#)]
40. Cobb, T. One size fits all? Francophone learners and English vocabulary tests. *Can. Mod. Lang. Rev.* **2000**, *57*, 295–324. [[CrossRef](#)]
41. Petrescu, M.C.; Helms-Park, R.; Dronjic, V. The impact of frequency and register on cognate facilitation: Comparing Romanian and Vietnamese speakers on the Vocabulary Levels Test. *Engl. Specif. Purp.* **2017**, *47*, 15–25. [[CrossRef](#)]
42. Reynolds, B.L. The effects of target word properties on the incidental acquisition of vocabulary through reading. *TESL-EJ Teach. Engl. Second Foreign Lang.* **2016**, *20*, n3.
43. Medietilsynet. *Barn og Medier 2022: En Undersøkelse om 9–18-Åringers Medievaner*; Medietilsynet: Fredrikstad, Norway, 2022.
44. Brevik, L.M.; Hellekjær, G.O. Outliers: Upper secondary school students who read better in the L2 than in L1. *Int. J. Educ. Res.* **2018**, *89*, 80–91. [[CrossRef](#)]
45. Germundson, C.F. *Extramural Gaming and English Vocabulary*. Master's Thesis, University of Oslo, Oslo, Norway, 2022.
46. Nordnes, O.-K.R. *TV, Reading, Gaming and Gaining? A Quantitative Study on the Effects of Extramural Exposure to Authentic English in Norwegian Fifteen-Year-Old L2 Learners*. Master's Thesis, NTNU, Trondheim, Norway, 2021.
47. Nordfjellmark, K. *Extramural Activities, Different Types of Gaming and the Effect on Norwegian Teenagers' English Language Proficiency*. Master's Thesis, NTNU, Trondheim, Norway, 2022.
48. Estensen, V. *Norwegian Primary Pupils' Extramural English Habits and English Vocabulary Acquisition*. Master's Thesis, University of Stavanger, Stavanger, Norway, 2021.
49. Kalhagen, M.H. *Norwegian First-Graders' English Vocabulary Knowledge and Exposure to Extramural English*. Master's thesis, NTNU, Trondheim, Norway, 2023.
50. Beglar, D.; Nation, P. A vocabulary size test. *Lang. Teach.* **2007**, *31*, 9–13.
51. Gyllstad, H.; Vilkaitė, L.; Schmitt, N. Assessing vocabulary size through multiple-choice formats: Issues with guessing and sampling rates. *ITL-Int. J. Appl. Linguist.* **2015**, *166*, 278–306. [[CrossRef](#)]
52. Gyllstad, H.; McLean, S.; Stewart, J. Using confidence intervals to determine adequate item sample sizes for vocabulary tests: An essential but overlooked practice. *Lang. Test.* **2021**, *38*, 558–579. [[CrossRef](#)]
53. Kremmel, B. Word families and frequency bands in vocabulary tests: Challenging conventions. *TESOL Q.* **2016**, *50*, 976–987. [[CrossRef](#)]
54. Warnby, M.; Malmström, H.; Hansen, K.Y. Linking scores from two written receptive English academic vocabulary tests—The VLT-Ac and the AVT. *Lang. Test.* **2023**, *40*, 548–575. [[CrossRef](#)]
55. R Core Team. *R: A Language and Environment for Statistical Computing*; R Foundation for Statistical Computing: Vienna, Austria, 2024.
56. Hyltenstam, K. Non-native features of near-native speakers: On the ultimate attainment of childhood L2 learners. In *Advances in Psychology*; Elsevier: Amsterdam, The Netherlands, 1992; Volume 83, pp. 351–368.
57. Nation, I. *Learning Vocabulary in Another Language*; Cambridge University Press: Cambridge, UK, 2022.
58. Ikier, S.; Dönerkayalı, C.; Halıcı, Ö.S.; Kaymak Gülseren, Z.A.; Göksal, H.; Akbaş, B. When is memory more reliable? Scientific findings, theories, and myths. *Appl. Neuropsychol. Adult* **2024**, *31*, 77–94. [[CrossRef](#)]
59. Utdanningsdirektoratet. *Fag- og Timefordeling og Tilbudsstruktur for Kunnskapsløftet Udir-1–2023*. Available online: <https://www.udir.no/> (accessed on 18 March 2024).
60. Stanovich, K.E. Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *J. Educ.* **1986**, *189*, 23–55. [[CrossRef](#)]

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