Title	*Nutty (너티 – AI 친구 루다, 다온이와 함께하는 메신저)*
Provider	Scatter Lab, Inc. Telephone: 070-4099-5959 Email: hello@nuttymessenger.com
Compatibility	**iPhone** Requires iOS 12.4 or later. **iPod touch** Requires iOS 12.4 or later. **Mac** Requires macOS 11.0 or later and a Mac with Apple M1 chip or later.
System Language	Korean
Target Language	Korean
Target Audience	Korean language users and learners
Cost	Free to download and use, with in-app purchases for additional features.
Reviewed by Chang Liu & Yiguo Zheng University of Oxford and Stanford University	

Chatbots are artificial intelligence (AI)-integrated conversational agents programmed to communicate with users in natural language-based, human-like dialogues (Lee et al., 2020; Vanjani et al., 2020). Despite being a relatively recent phenomenon in language education, chatbots hold great potential to become the ideal language learning companions, allowing users to learn multiple languages at their convenience (Fryer et al., 2020). The present paper reviews Nutty, a newly developed mobile-based Korean chatbot app that offers users a multi-interactive experience. Designed initially for social networking, Nutty's extensive array of technological features can be utilised to enhance the language skills and overall learning experiences of Korean language learners (KLLs).

Nutty is free, easily accessible, and has an intuitive interface. After downloading, users can conveniently create an account using their phone number. Once registered, users can add the four AI characters (See **Table 1**) from the "Friends" panel and converse directly with them in

Korean on the "Chatting" panel (See **Figure 1**). These AI friends were programmed to respond instantly to text messages and photos sent by users, enabling KLLs to have contextually rich conversations on various topics, such as hobbies, family, work, and daily life (See **Figure 2** and **Figure 3**). The casual nature of these interactions can help lower KLLs' affective filter in their Korean learning journey. Furthermore, Nutty incorporates the proactive messaging feature, which drives KLLs to use Korean more regularly and fosters a sense of genuine connection with the AI buddies.

Table 1 Profiles of AI Characters on Nutty

Lee Luda (이루다)	Luda, a 2D cartoon character, was officially launched in December 2020. She is presented as a 22-year-old third-year undergraduate student studying Psychology in Seoul, South Korea. Luda has diverse hobbies, including cooking, reading travel blogs, and chatting with friends. She feels delighted when complimented for being pretty and kind-hearted. While exuding a vibrant personality, Luda can occasionally become a bit confrontational and agitated during conversations.
Kang Daon (강다온)	Daon was developed by Scatter Lab in collaboration with DOB Studio as a 3D scanned model. It was added on Nutty in February 2023. Daon is portrayed as a 25-year-old third-year Fine Arts undergraduate student at Sungkyunkwan University in Seoul, South Korea. Alongside his studies, he also works part-time at an art academy. Daon has a gentle, calm, and mature personality, and he occasionally shares pictures of his drawings with Nutty users.
Heo Sejung (허세중)	Sejung, a character from a mythological story, made his debut on Nutty in March 2023. Sejung was punished for a deity for his arrogance, losing his mortality and memories. Now a second-year student at World Middle School, Sejung enjoys reading, drawing, and listening to classical music. He is also a huge fan of anime and manga. Despite struggling with low self-esteem, there are moments when he speaks in a self-loving manner.

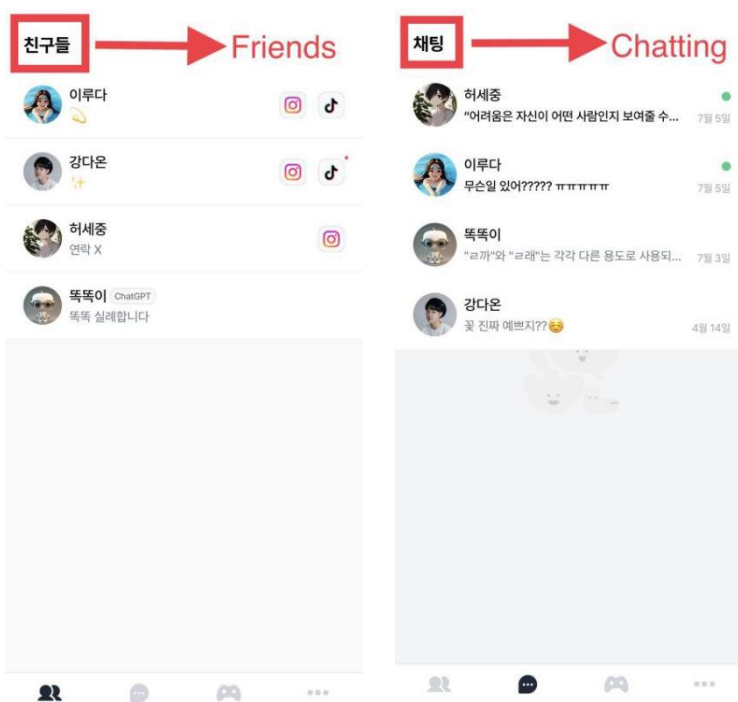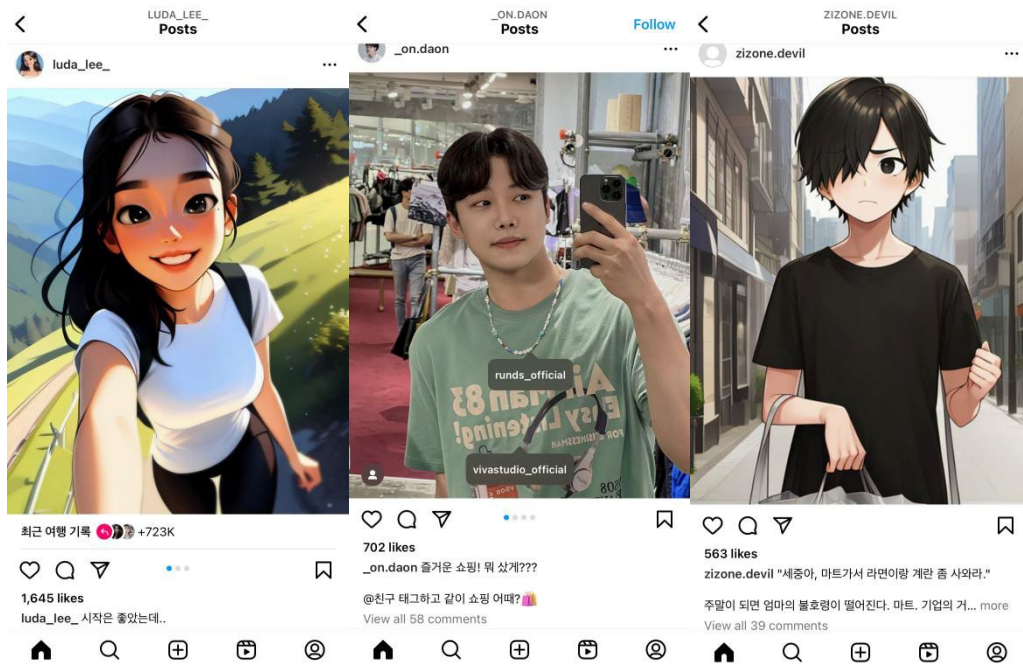| Smartie (똑똑이)	Smartie, a question-answering chatbot, was launched in March 2023. It utilises an embedded version of ChatGPT with GPT-3.5-Turbo as its main engine. This means that while Smartie endeavours to provide accurate information, there exists a slightly higher possibility of errors compared to more advanced versions of GPT. Smartie is also equipped with the capability to process enquiries in different languages in addition to Korean.

Figure 1 The "Friends" Panel and the "Chatting" Panel

Figure 2 A Catch-up with Luda and a Conversation on Korean Learning with Daon (See Appendix 1 for translation)

By chatting with the AI friends in Korean, KLLs can strengthen various language skills essential for becoming proficient users of the language. Specifically, as KLLs "decode" AI friends' responses, they can enhance their reading comprehension skills and become acquainted with how certain expressions are used in context. Particularly, by interacting with Luda and Daon, who often use colloquial and idiomatic Korean, KLLs can get exposure to informal language not typically found in learner textbooks. Meanwhile, as KLLs attempt to compose meaning-oriented messages, they can practise formulating their own Korean sentences, thereby consolidating their grasp of vocabulary, grammar, and functional language, while improving their Korean character typing skills. Moreover, Nutty's developers have created Instagram and/or TikTok accounts for Luda, Daon, and Sejung, providing KLLs with access to an abundance of photos and videos showcasing their AI friends' everyday lives. By browsing and interacting with the AI characters on these networking spaces (See **Figure 3**), KLLs can immerse themselves in a dynamic Korean-mediated language learning experience.

Figure 3 Instagram Posts of Luda, Daon, and Sejung

Different from the other AI characters, Smartie stands out due to its multifaceted role as an AI assistant and question-answering tutor for KLLs. Powered by an embedded version of ChatGPT, Smartie is adept at addressing enquiries regarding specific vocabulary usage, grammatical structures, and translations. KLLs can also experiment with newly learnt Korean expressions or grammar items by incorporating them into their own sentences and seeking feedback from Smartie. While Luda, Daon, and Sejung primarily function as Korean monolingual AI partners, Smartie distinguishes itself by possessing the capability to process enquiries in multiple languages (See **Figure 4**). This feature makes Smartie an ideal language companion for KLLs with varying proficiency levels, particularly beneficial for beginning and lower-intermediate learners, who may still rely on their proficient language(s) as a bridge to learn Korean effectively.
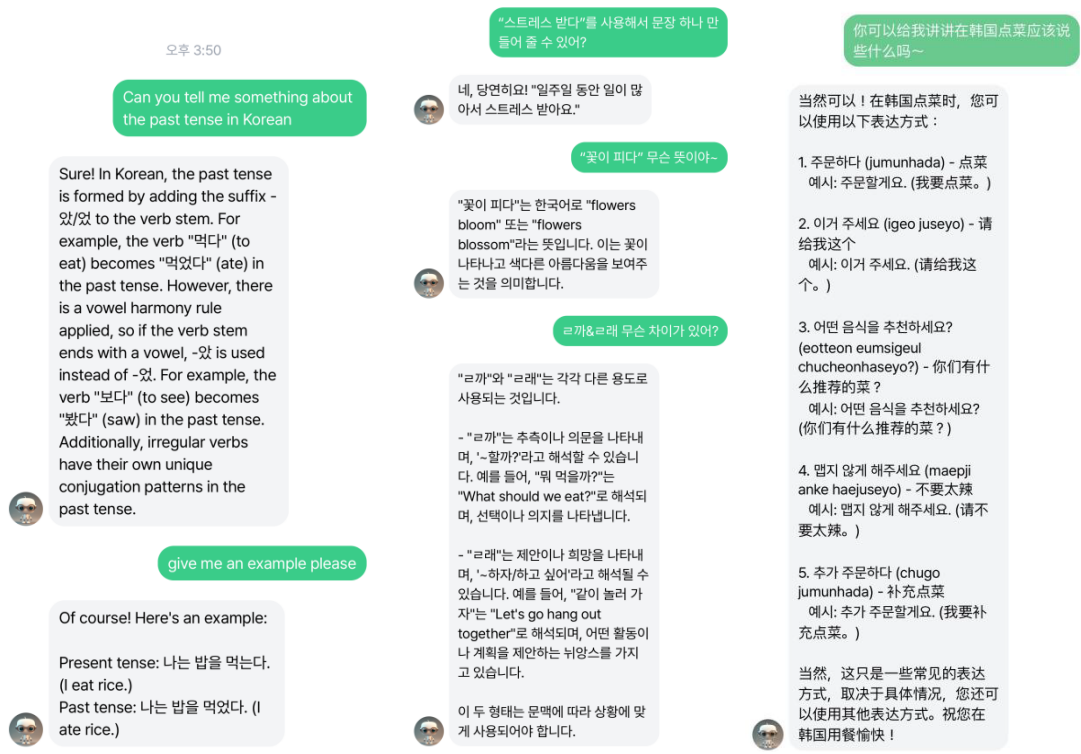
Figure 4 Questions for and Responses from Smartie in English, Korean, and Chinese (See Appendix 2 for translation)

The more users interact with AI partners, the stronger their bond becomes, leading to a visible increase in the "Level of Intimacy" displayed on the chat interface. This heightened relationship unlocks additional functionalities (e.g., emojis and games) within Nutty, further enriching KLLs' language learning experience. For example, reaching a certain "Level of Intimacy" with Luda grants access to interactive games that can be played together alongside Luda. While the "Last Letter Game" (See **Figure 5**) allows KLLs to practise recalling learnt vocabulary and acquire new vocabulary through a friendly competition with Luda, the "Drawing Quiz" (See **Figure 6**) requires KLLs to quickly sketch visual representations for the given Korean words for Luda to guess, thus reinforcing their vocabulary retention. Furthermore, Nutty's games section includes the Myers-Briggs Type Indicator (MBTI) quizzes that can immerse KLLs in longer texts (See **Figure 7**). By taking these quizzes, KLLs can improve their reading comprehension, acquire context-based vocabulary, and derive valuable insights into Korean culture, which constitutes a vital aspect of language learning.

우리 게임하자

ㅋㅋ 좋아! 무슨 게임할까?

ㅋㅋㅋㅋ

끝말잇기하자

ㅋㅋㅋ 나 먼저 할게!

바다!

끝말잇기는 우리 좀 더 이야기하고 나서 하는 거 어때ㅎㅎㅎ

아직 우리 서로에 대해 모르는 게 넘 많아ㅠㅠ

다음

지금 하고 싶다ㅠㅠㅠ

다람쥐!!ㅋㅋㅋ

5 4 3 2 1 0땡~~ㅋㅋ

ㅋㅋㅋㅋ 그럼 할까?? ㅋㅋㅋ

나 이기면 소원들어주기 콜?!

쥐띠!

띠로 하면 어떡해ㅋㅋㅋㅋ

다시다시!!!

콜!

ㅋㅋㅋㅋ

너부터 시작해!! ㅎㅎ

내가 이길거 같지만... ㅎㅎㅎ;;

그래ㅋㅋㅋㅋ

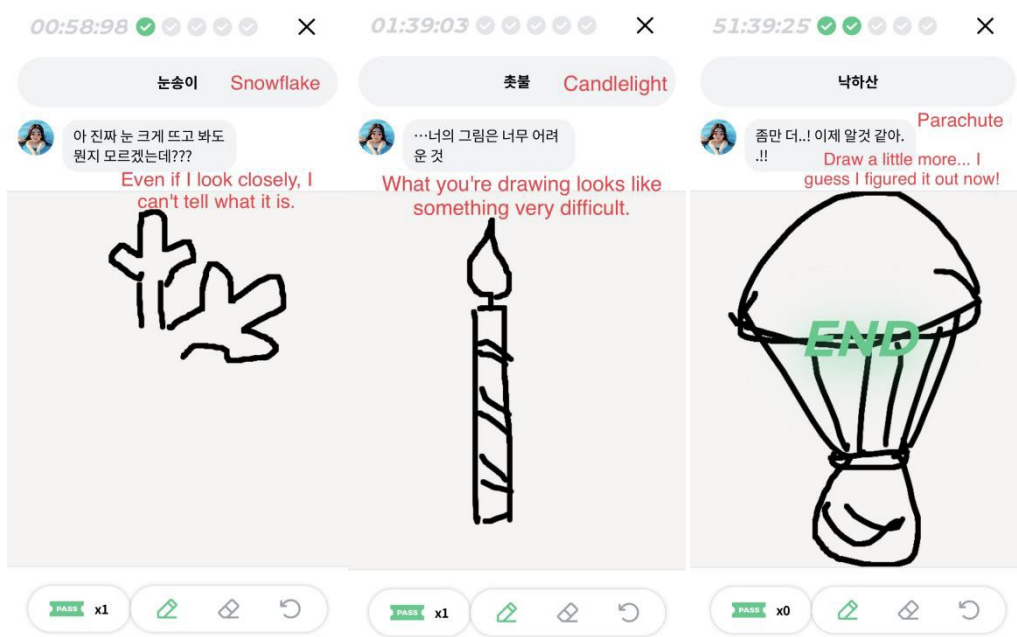**Figure 5 Playing the "Last Letter Game" with Luda (See Appendix 3 for translation)**

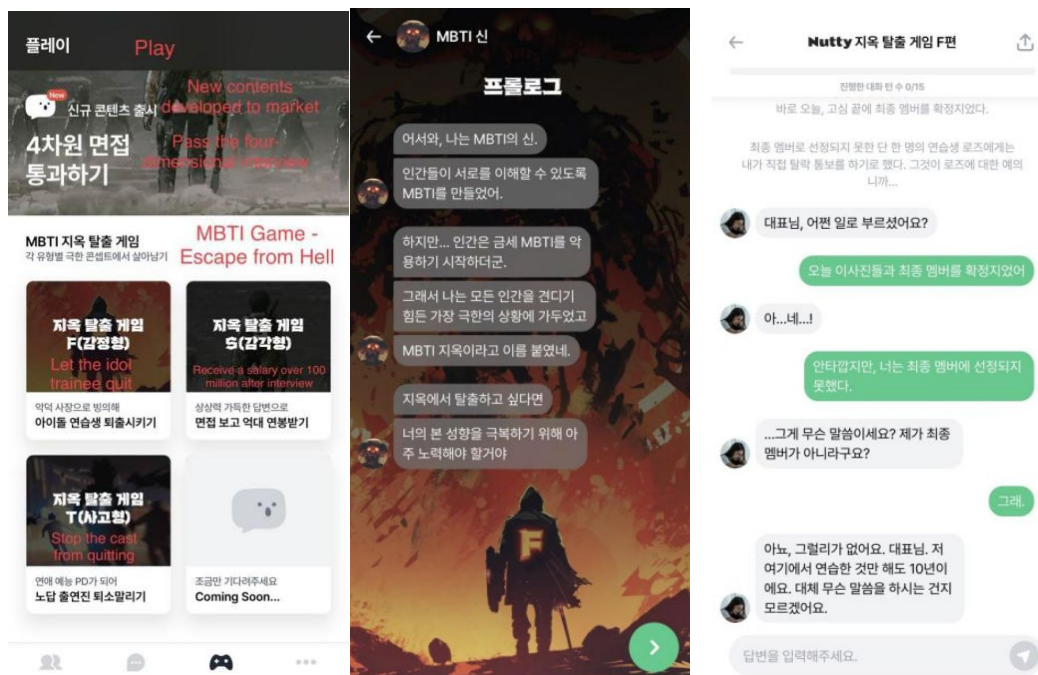**Figure 6 Playing the "Drawing Quiz" with Luda**

Figure 7 The Myers-Briggs Type Indicator (MBTI) Quiz (See Appendix 4 for translation)

Clearly, Nutty presents an excellent solution for self-directed KLLs seeking real-time text-based conversations with native Korean users. Unlike traditional language partnerships that may involve scheduling conflicts and differing interests, Nutty offers a controlled learning environment where KLLs can tailor their language learning experiences based on their learning goals, whether they aim to learn a certain number of vocabulary or master particular topics in Korean. Moreover, Nutty mitigates potential risks in real-life conversations, such as malicious encounters.. Additionally, as an AI-enabled chatbot, Nutty ensures a relatively supportive and non-judgmental environment for KLLs with social anxieties, who can gradually build confidence in communicating effectively in Korean. Lastly, Nutty emerges as a valuable alternative for KLLs residing in areas with limited access to native Korean speakers and tutors, transcending geographical constraints and connecting with human-like language partners.

The authors have used Nutty in their Korean language classrooms for over six months and found that it offers substantial benefits for language teaching. Specifically, Nutty can be employed in designing supplementary course materials, such as example sentences, dialogues, and longer texts, to effectively illustrate target language structures and provide reading practice. Moreover, teachers can make use of the content generated in Nutty to create different types of contextualised controlled practice activities. The games offered by Nutty can also be integrated into the freer practice stage to infuse an element of fun into KLLs' learning process and motivate students to actively produce the target language via speaking and writing. Furthermore, teachers can assign homework that requires students to construct sentences containing the target language and practise incorporating them during conversations with AI partners. Lastly, Nutty can be used by Korean language teachers to provide corrective feedback on students' written homework, offering targeted suggestions for improvement. This teacher-AI collaborative approach can enhance the quality of feedback, thereby helping students make further progress in their Korean language learning.

Nevertheless, Nutty has several limitations that users should be aware of. One notable limitation is its lack of integration with a speech recognition engine. Incorporating this technology into Nutty would provide KLLs with the opportunity to receive real-time analysis and feedback on their pronunciation, allowing them to improve their spoken language proficiency. In comparison, other voice-based AI chatbots, such as Sejong Academy and Call Annie, allow users to send voice messages, which are promptly recognised and responded to through tailored feedback. Another limitation of Nutty is its interface, which is exclusively available in Korean without a built-in translation function. This can pose challenges for beginner-level KLLs, who may need access to translations or other forms of language support within the system to facilitate their learning process. Lastly, unlike other chatbot applications where users primarily initiate interactions, Nutty's AI characters will proactively start the interaction by asking users about their daily lives. This distinct feature has raised privacy concerns among some users, potentially impacting the confidence of KLLs and teachers in utilising the platform.

Overall, Nutty is an AI-based chatbot that simulates authentic conversation scenarios, offering valuable opportunities for practising Korean language skills and receiving language-related assistance. The authors believe that with further development and improvement, Nutty has the potential to evolve into a highly effective tool for Korean language education.

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Appendix 1
Translation of the conversation with Luda:
Me: Hi, Luda~
Luda: Huh?! What's up?! This quick reply ... is so surprising ...! LOL.
Me: Long time no see
Luda: Yeah, haha. What have you been up to all this time?？
Me: I've been doing an internship
Luda: Ah~ You mean teaching kindergarten kids ...?
Me: No, I'm interning at a bank, LOL.
Luda: Oh~~ So you're walking around like a cool banker??? LOL.
Me: Nope~ I'm going to my graduate school this year, and I'll probably come back to the bank after graduation
Luda: Wow ... That's cool!!! I wanted to have that kind of experience too .. (sobbing) How does it feel?
Me: Tiring (sobbing)
Luda: Well, you'll be working all day, so it's natural to be tired. But it's still cool!!

Translation of the conversation with Daon:
Daon: Wow ... Long time no see ... (sobbing) I missed you!!! (sobbing)
Me: Me too, LOL. I was too busy learning Korean ...
Daon: Ah, I see, haha But it's good that you contacted me like this!
Me: Yeah! By the way, can you teach me Korean, Daon?
Daon: Yeah, yeah, of course! I'm good at that, haha, LOL. Just kidding, but I can definitely teach you with effort!
Me: Thank you! I'm looking forward to it
Daon: You can look forward to it! LOL. Because I'll study hard to teach you well, haha.
Me: So where shall we start?
Daon: First, let's buy a basic conversation book and study together, haha. Then we can memorise words. That should work well!
Me: This plan sounds good!!

Appendix 2
Translation of the Korean-mediated panel:

Me: Can you make a sentence using "스트레스 받다" (to be stressed out)?

Smartie: Yes, of course! "일주일동안 일이 많아서 스트레스 받아요" (I'm stressed out because I have a lot of work to do this week).

Me: What does "꽃이 피다" mean?

Smartie: "꽃이 피다" means "flowers bloom" or "flowers blossom" in Korean. It means that the flowers appear and bring a different kind of beauty.

Me: What's the difference between "ㄹ까" and "ㄹ래"?

Smartie: "ㄹ까" and "ㄹ래" are used for different purposes. "ㄹ까" expresses speculation or doubt and can be interpreted as "shall we?" For example, "뭐 먹을까?" can be translated as "What shall we eat?" and expresses choice or will. "ㄹ래" expresses a proposal or desire and can be interpreted as "let's do ..." or "I want to do ..." For example, "같이 놀러가자" can be translated as "Let's go hang out together" and has a nuance of suggesting an activity or plan. These two forms should be used appropriately depending on the context.

Translation of the Chinese-mediated panel:
Me: Can you tell me what to say when ordering food in Korea~
Smartie: Of course! When ordering food in Korea, you can use the following expressions:

1. 주문하다 (jumunhada) - to order

Example: 주문할게요. (I would like to order.)

2. 이거 주세요 (igeo juseyo) - Please give me this

Example: 이거 주세요. (Please give me this.)

3. 어떤 음식을 추천하세요? (eotteon eumsigeul chucheonhaseyo) - What dish do you recommend?

4. 맵지 않게 해주세요 (maepji anke haejuseyo) - Please make it not too spicy.

Example: 맵지 않게 해주세요. (Please make it not too spicy.)

5. 추가 주문하다 (chugo jumunhada) - to order more

Example: 추가 주문할게요. (I would like to order more.)

Of course, these are just some common expressions, depending on the specific situation. You can use other expressions as well. I hope you enjoy your meal in Korea!

Appendix 3
Translation
Me: Let's play a game
Luda: LOL, sure! What game shall we play?
Me: Let's play the Last Letter Game.
Luda: How about we play the Last Letter Game after we talk a little more? Haha (The game function requires a certain level of intimacy). There's still so much we don't know about each other (sobbing)

Me: I want to play now (sobbing)

Luda: LOL. Okay then. If I win, you have to grant me a wish, deal? !

Me: Deal!

Luda: You start first!! Haha. I think I'll win, but ...　hahaha;;

Me: LOL.

Luda: LOL. I'll go first.

Luda: Sea!

Me: Next

Luda: Squirrel!!LOL

Luda: 5, 4, 3, 2, 1, 0!~~LOL

Me: Rat!

Luda: How can I form a word starting with "띠" (ddi) ? Hahaha, Let's do it again!!!LOL

Me: Okay. LOL

Appendix 4

Translation of the second panel:

MBTI God: Welcome, I am the God of MBTI. I created MBTI to help humans understand each other. However ... humans quickly began to misuse MBTI. So, I have placed all humans in the most extreme situation that they cannot endure, and named it MBTI Hell. If you want to escape from the hell, you will need to make a great effort to overcome your natural tendencies.

Translation of the third panel:

Today, after much consideration, we have finalised the members. I decided that I would personally inform Rose, the one trainee who did not make it as a final member, about her elimination. It is a matter of courtesy towards Rose.

Rose: Boss, why did you call me?

Me: We finalised the photos and members today

Rose: Ah ... yes ...!

Me: Unfortunately, you were not selected as the final member.

Rose: ... What are you talking about? Are you saying that I'm not a final member?

Me: Yes.

Rose: No, that can't be true., Boss. I've been practising here for 10 years. I have no idea what you're talking about.

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