The University of Osaka
Institutional Knowledge Archive

Title	Development of the Multi-Dimensional Measure of Online Disinhibition, and Examination of its Validity and Reliability
Author(s)	Wen, Ruohan; Miura, Asako
Citation	Osaka Human Sciences. 2024, 10, p. 19-38
Version Type	VoR
URL	https://doi.org/10.18910/94827
rights	
Note	

The University of Osaka Institutional Knowledge Archive : OUKA

https://ir.library.osaka-u.ac.jp/

The University of Osaka

Development of the Multi-Dimensional Measure of Online Disinhibition, and Examination of its Validity and Reliability[1, 2, 3]

Ruohan WEN[1] and Asako MIURA[2]

Abstract

This study aimed to develop the Multi-Dimensional Measure of Online Disinhibition (MMOD) which has a multi-dimensional perspective on the online disinhibitive psychological states and its related cognitions and to evaluate its validity and reliability. In study 1, 73 items related to online disinhibition were generated from 20 semi-structured interviews. The expression of the items was modified repeatedly according to two preliminary surveys. The results showed that 25 items were screened out as preliminary MMOD. In study 2, 4-factor structure and 3-factor structure were compared according to the exploratory and confirmatory factor analysis. Finally, 3-factor (Unique perspective on online environment, change of alienation cognition and change of relationship cognition) and 12 items of the MMOD was confirmed. Correlation analysis with the prior scales showed that MMOD has good validity.

Key words: online disinhibition, internet, scale development

1. Introduction

In virtual spaces, such as the Internet, people do things that they would not do in real life. For example, some people may disclose secrets in online environments that they would not talk about in face-to-face situations, whereas others may harshly criticize others anonymously on social media in a manner that they would never do in real life. Suler (2004) attributed this phenomenon of different online and real-world behaviors to the "Online Disinhibition Effect (ODE)." The author divided online disinhibition into two categories: benign disinhibition (BD), whereby low psychological defenses help people open up to others, which may even help resolve interpersonal relationship issues; and toxic disinhibition (TD), whereby people undertake offensive behaviors because of a lack of fear of substantial punishment. Suler (2004) have noted six factors related to the online environment and Computer-Mediated Communication (CMC) that may lead to online disinhibition: dissociative anonymity, invisibility, asynchronicity, dissociative imagination, solipsistic introjection, and minimization of status and authority (Suler, 2004; Barak, Boniel-Nissim, & Suler, 2008). As CMC permeates people's daily lives, the theory of the online disinhibition effect highlights the characteristics of human behavior and psychology on the Internet, and has made its presence felt in recent behavioral/social science and informatics research. According to Google Scholar, 4795 studies have cited Suler (2004) as of November 13, 2021.

However, as Suler (2004) did not provide a concrete and clear definition of online disinhibition, subsequent studies have used diverse definitions. Wen and Miura (2022/2023) observed that overall, studies adopt three conceptual perspectives of online disinhibition: "onset" (emerging from the six aforementioned factors of the online environment, which generates ODE), "behavior" (specific and typical behaviors, such as cyberbullying, trolling, and online self-disclosure), and a "disinhibitive mental state" (individuals experience lower restraint) that connects both onset and behavior. The constructs of online disinhibition vary across perspectives, increasing the complexity of developing measurement tools.

Limitations of previous research

Schouten, Valkenburg, and Peter (2007) were among the first to measure online disinhibition. The authors measured online disinhibition from the perspective of "a psychological state in which a person feels less inhibited to exhibit certain behavior" (the "mental state" mentioned in this study refers to this). The authors used a scale comprising three items that asked about cognition (e.g., "During IM, I feel less constrained to use certain words than in a face-to-face meeting"). Next, Udris (2014) created a 2-factor, 11-item Online Disinhibition Scale (ODS; the Japanese version of the ODS: Table S1) based on Suler's (2004) online disinhibition theory and showed a correlation between disinhibition and cyberbullying. In recent years, the ODS has been the most frequently used scale to measure online disinhibition; however, it has certain limitations. For example, the conceptual definition of online

disinhibition is unclear and some of the items are "double-barreled," (cf. Stuart & Scott, 2021; Wen & Miura, 2022/2023). As a specific example, one item in the ODS reads, "The Internet is anonymous, so it is easier for me to express my true feelings or thoughts." The objective characteristic of the online environment of "anonymity" and the result of "easy to express what you really think and feel" are mixed. Some recent studies note that online environment characteristics, such as anonymity, do not necessarily lead to online disinhibition or disinhibitive behavior (e.g., Lapidot-Lefler & Barak, 2012, 2015). Thus, Stuart & Scott (2021) emphasize that assessments of disinhibition should be disambiguated from the features of the internet as well as from the potential outcomes of online disinhibition.

Based on this context, Stuart and Scott (2021) developed a new scale called the Measure of Online Disinhibition (MOD; Table S2) based on a clear definition of online disinhibition, thereby improving over Udris (2014), and with more comprehensive content, thereby improving over Schouten et al. (2007). The MOD is based on the definition of online inhibition as "the perception or experience of reductions in restraint in the online environment such that individuals may act, think, and feel differently online when compared to face-to-face interactions;" this definition is similar to that of Schouten et al. (2007) and consists of one factor and 12 items. Subsequently, they confirmed the construct validity of the MOD by finding a positive relationship between trolling and online self-disclosure. The MOD is strongly correlated with the ODS, solves the double-barrel problem, and is based on clear conceptual definitions.

However, while the MOD is a scale that can accurately measure the mental states of online disinhibition, it has the following limitations. The MOD items were developed based on the actual situation of online disinhibition through eight group discussions with 20 participants. However, they pursued a narrow approach that the construct is an absolute "mental state" (that is, excluding anything that cannot be considered a "mental state"). Consequently, the final items turned out to be quite simple. Approximately half of the MOD items ask whether participants are "tougher/less cautious/assertive/ more competitive/confident/extroverted online than offline," while the remaining half generally asserts that "the ways of talking or acting on the Internet are different from offline." Such simple content followed a single-factor structure that closely resembled the benign disinhibition factor of ODS (Udris, 2014). Additionally, the specific process of cognitive change through which people reach a mental state of online disinhibition was not referenced. However, according to Suler (2004), the process by which CMC characteristics lead to a mental state of online disinhibition involves changes in the cognition of various social phenomena due to changes in the communication environment. The MOD, with its single-factor structure, does not describe such cognitive changes, making it difficult to explore online disinhibition in depth.

According to Suler (2004), people act according to their social identities in the real world; however, when they enter anonymous online environments, their cognition of their social identities becomes ambiguous, leading to disinhibition. Alternatively, in CMC, in which participants are invisible to each other, the expression of opinions is facilitated because there is no need to worry about one's appearance, voice, or reactions from the other party (Suler, 2004). The cognition of social phenomena, such as one's

social identity and awareness of other people's reactions to oneself, plays a role in restraining human behavior in real situations. However, these restraints become ineffective in online environments (cf. Wen & Miura, 2022/2023). Specifically, eliminating these restraints on cognitions (i.e., not being bound by one's social identity or eliminating concerns about one's appearance, voice, and other peoples' reactions) leads to greater self-assertion in online communication. This may make people feel strong, confident, or extroverted (i.e., aspects of MOD measures). However, with a single-factor-structure, the items of the MOD only cover superficial changes in psychological state; hence, it is not possible to specifically examine the kind of cognition that causes the resulting behavior.

In fact, not only concerns about one's social identity, appearance, and voice, as described above, but also the cognition of various social phenomena (e.g., public self-consciousness and social norm consciousness) plays a role in inhibiting daily behaviors (Wen & Miura, 2022/2023). That is, from the perspective of changes in the behavioral inhibition function due to cognition, the mental state of online disinhibition may span multiple dimensions. Stuart and Scott (2021), the developers of MOD, also highlighted this possibility. Thus, to examine the mental states of online disinhibition more deeply, it is necessary to consider the kinds of changes in the cognition of social phenomena that exist in the deep mental states represented by the constructs of the MOD.

Based on the above discussion, this study explores the multi-dimensional structure of online disinhibitive mental states and related cognitions of social phenomena to develop a Multi-Dimensional Measure of Online Disinhibition (MMOD). Specifically, we refer to the definition of online disinhibition by Stuart and Scott (2021) and define online disinhibition as "a mental state in which the inhibition function of cognitions of various social phenomena weaken or disappear in an online environment." In Study 1, we explore the cognition of social phenomena related to online disinhibition (e.g., public self-consciousness and social norm consciousness) as broadly as possible. In Study 2, we develop a scale that comprehensively measures online disinhibition, and examine its validity and reliability.

2. Study 1: Preliminary Scaling

Overview

In Study 1, we explored the cognition of social phenomena related to disinhibition as broadly as possible through semi-structured interviews with Internet users. Based on these interviews, we generated many items to measure the mental states of online disinhibition. We then constructed a preliminary online disinhibition scale using multiple surveys.

Semi-structured interview and item generation/translation

Semi-structured interviews were conducted with Internet users regarding their experiences and behaviors in an online environment. In the first half of the interview, we asked participants about basic information on their Internet usage and heard about specific episodes of frequent situations. In the second half, from multiple scenarios (Table S3) depicting scenes in which online disinhibition occurred

frequently, we selected two themes that were easy to imagine based on each participant's Internet usage described in the first half. We asked the participants what they would do and think if they encountered these situations.

The interviewees were Chinese Internet users who were acquaintances of the first author.[4] Between January 4 and March 2, 2021, we interviewed 20 people (11 women, 4 international students living in Japan, M_{age} = 22.14, SD = 3.08). Each interview lasted approximately one hour, and the interviewees were paid 30–50 RMB (equivalent to 450–750 yen) per hour. This amount was based on the 2020 Shanghai minimum hourly wage (22 RMB). The interview survey was conducted online and by voice only using the instant communication tool "QQ," which is commonly used in China.

In the content analysis of the transcribed data, we identified the online disinhibitive mental state while strictly distinguishing between "disinhibitive behavior" and "characteristics of the online environment." To conveniently scrutinize the vast amount of data as efficiently as possible without omitting important aspects, we classified the data based on eight categories, which were set beforehand based on prior research, considering the types of cognition related to the mental states of online disinhibition. These categories are not the multiple dimensions of online disinhibition or factor structure of the scale that this study aimed to use. The categories are decline in identity cognition (cf. Suler, 2004), decline in social networks cognition (cf. Suler, 2004; Wu, Lin, & Shih, 2017), decline in reality mode (cf. Suler, 2004), decline in immoral perception (cf. Paciello, Tramontano, Nocentini, Fida, & Menesini, 2020), controllability of behavior (cf. Schouten et al., 2007), decline in social reality (cf. Suler, 2004; Schouten et al., 2007), decline in empathy (cf. Terry & Cain, 2016), and decline in alienation cognition (cf. Suler, 2004).

The preliminary scale items were created based on the content analysis results. First, the native Chinese speaker first author generated 73 items (7–15 items in each category) in Chinese and translated these into Japanese. Next, all authors examined and confirmed the suitability of the Japanese expressions using back-reverse translation. A social psychologist, who was a native Chinese speaker but fluent in the Japanese language, executed the reverse translation without proofreading while being unaware of the purpose and procedures of this study. The second author, a native Japanese speaker, checked the Japanese translations of all interview logs to ensure that the items did not include references to unique services or usage restrictions in China. Based on the opinions of the second author and several social psychologists, we revised the Japanese expressions to enhance their naturalness. Moreover, as we aimed for a scale with high versatility, we attempted to avoid including expressions that limit the situation (such as "When I am playing the online game…") as much as possible.

Revision of preliminary scale items

First preliminary survey   In the first preliminary survey, we examined whether the items created based on the content analysis were appropriate as psychological scales and made the necessary corrections. The criteria were that the items must be easy to answer for a large number of participants and that there should be no ceiling or floor effects. Owing to the large number of items, 73 items were

randomly selected from item sets A (37 items) and B (36 items), one of which was randomly assigned to the participants. In all subsequent surveys, items on the multiple-item psychological scale were randomly presented to each participant. The structure of the questionnaire was as follows (preview URLs for all surveys are listed in Appendix Table S5):

1. We explained the purpose of the survey and obtained their consent to participate.

2. Regarding the percentage of Internet usage in daily life, we asked respondents to respond on a 10-point scale ranging from "1. Rarely" to "10. Almost always." Next, we asked whether they had any friends with whom they communicated solely through the Internet, and whether they had ever been involved in trouble on the Internet. Respondents who had experienced trouble were asked to describe specific details. Hereafter, these questions are collectively referred to as "Internet usage status."

3. Participants were asked to respond to each item of item sets A or B on a preliminary online disinhibition scale using a 6-point scale ranging from "1. Strongly disagree" to "6. Strongly agree." To clarify that the questions were intended to probe the respondent's perception, they were prefaced with the following statement: "Please answer what you usually think, without limiting yourself to a specific scene or person. Please answer considering your own thoughts and try not to think about what other people or people in general may think." In addition, respondents were asked to select "does not apply to me" for items they found difficult to judge, such as those that did not match the respondents' Internet usage, and "we do not understand the meaning of the item" for items that were difficult to understand in Japanese. Each set included one attention check item ("Be sure to select 'we agree' here.") to check for minimization of effort (Miura & Kobayashi, 2018). The data of respondents who chose an answer other than "we agree" for this item were excluded from the analysis.

4. For an exploratory examination of the relationship with personality, we measured the Japanese Ten Item Personality Inventory (TIPI-J, Oshio, Abe, & Catroni, 2012). Participants were asked to respond to ten items on a 7-point scale ranging from "completely disagree" to "strongly agree."[5]

5. Respondents were asked to provide information on age, gender, and educational attainment.

6. We asked for free-answer comments and questions.

On July 6, 2021, we commissioned the crowdsourcing company Crowdworks Co., Ltd. to recruit 1,000 Japanese speakers aged 18 years and older. Assuming a response time of approximately 12 minutes, the compensation was 100 yen.[6] In total, 553 and 551 people for item sets A and B, respectively, accessed and responded to the questionnaire. We excluded the data of those who stopped answering halfway through, answered the attention check items incorrectly, did not report their gender and age, and whose answers were the same. Consequently, item set A included data from 501 participants (female $= 316$, $M_{age} = 40.93$, $SD = 10.38$), and item set B included data from 494 participants (female $= 298$, $M_{age} = 40.04$, $SD = 10.39$).

HADon17_202, a free statistical analysis tool programmed by Shimizu (2016), was used for the

Table 1   Preliminary multidimensional measure of online disinhibition (Study 1)

Instruction:
"The following items present various perspectives on the online environment. Please answer each item based on your own opinion rather than considering other people's views, and without reference to any specific scene or interaction with a particular person."

	Items	Categories
MMOD1	On the Internet, no matter what I do, it will not affect my real image too much.	Decline in identity
MMOD2	What I talk or act online are not bound by social status or position in the real world.	cognition (2)
MMOD3	On the Internet, even if I think I have done something that is not good, I will not feel so guilty.	Decline in immoral
MMOD4	On the Internet, sometimes I do not adhere to the morals that I follow in the real world.	perception (6)
MMOD5	I can escape from the thin relationships on the Internet anytime.	
MMOD6	My relationships on the Internet are shallow, and there are not many deep connections.	Decline in social
MMOD7	The friends or acquaintances I make online are mostly people who I would not have any contact with in the real world.	networks cognition (6)
MMOD8	I don't think anyone will get back at me for saying whatever I like to others on the internet.	
MMOD9	I can freely remark popular people or things on the Internet.	Decline in social
MMOD10	Judging the good and the bad of things is not as complex online as it is in the real world.	reality (3)
MMOD11	On the Internet, I can shape trends of people or somethings as my wish.	
MMOD12	I can encounter more people who meet my expectations online than in the real world.	
MMOD13	I feel that the people I interact with online have more similar values to me than acquaintances in the real world.	Decline in alienation
MMOD14	There are people on the Internet who understand my frustrations and pain in the real world.	cognition (8)
MMOD15*	I do not feel a sense of familiarity with strangers online.	
e	I often think carefully about whether my saying or doing in public on the Internet would be considered offensive.	
MMOD17*	On the Internet, I am often mindful of how my words and actions may impact my relationships with friends and acquaintances.	Decline in empathy (8)
MMOD18*	If I send a direct message to a stranger online, I always consider whether it will bother him/her.	
MMOD19*	On the Internet, I always concern about how my family might perceive my words and actions.	
MMOD20	It is inevitable that some people will misunderstand what I talk or act online.	
MMOD21	On the Internet, I can behave as I like without the various restrictions of the real world.	Decline in reality
MMOD22	On the Internet, I sometimes behave according to rules that are different from those in the real world.	mode (7)
MMOD23	On the Internet, I can show a side that I don't want to show in real life.	
MMOD24	When communicating on the Internet, other persons cannot know the real situation that I am in.	Controllability of
MMOD25	If I don't want to continue a relationship with someone online, I can end it anytime.	behavior (9)

Note: MMOD: Multi-Dimensional Measure of Online Disinhibition. The numbers in parentheses in the "Category" column indicate the remaining number of items within each category after conducting exploratory factor analysis to screen out items.

*: reverse item

data analysis. We examined the ease of answering the items based on the criteria that the percentage of respondents who answered "we do not understand the meaning of the item" or "It does not apply to me" did not exceed 10%. Furthermore, the presence or absence of ceiling or floor effects was examined using the criteria of mean +1 SD > 6 or mean -1 SD < 1, respectively. Consequently, eight items were deleted. Difficult-to-answer items were modified to include simpler and more concise expressions.

Second preliminary survey   In the second preliminary survey, data were collected on 65 items that were revised and selected after the first preliminary survey. After an exploratory examination of the structure using factor analysis, a preliminary online disinhibition scale was created. The second preliminary questionnaire was prepared by excluding the eight deleted items and TIPI-J from the first

questionnaire.

An appropriate sample size for conducting factor analysis is "a minimum number of 100 and as many as possible" (cf. Gorsuch, 1983; Shimizu, 2018). Hence, we set the sample size to 500. We commissioned Crowdworks to recruit participants between August 20 and 21, 2021. All subsequent studies excluded participants from previous studies. Assuming a response time of approximately 20 minutes, the compensation was 168 yen. A total of 547 respondents completed the questionnaire. Based on the same criteria as those of the first preliminary survey, the data of 23 participants were deleted list-wise, and the data of 524 participants (female = 362, M_{age} = 41.04, SD = 11.53) were analyzed. We then examined the ease of answering the questions and the presence or absence of ceiling or floor effects and modified the phrasing of the two items that did not meet the criteria.

Next, an exploratory factor analysis (maximum likelihood and promax rotation) was performed to examine the structure on the 5-, 6-, and 7-factor solutions, besides the 8-factor solution based on the categories used to create the items. In total, 15 items that revealed that all absolute values of factor loadings were less than 0.35 in each solution and one item that showed a factor loading opposite to the previously assumed direction was deleted.[7] Subsequently, from the remaining 49 items, 2 to 5 items were extracted from each category based on their importance in terms of conceptual structure and ease of answering. Finally, 25 items were used for the preliminary online disinhibition scale (Table 1).

3. Study 2: Scale development and examination of validity and reliability

Overview

Based on the preliminary online disinhibition scale generated in Study 1, we developed a more refined scale and examined its validity and reliability. We conducted multiple surveys and searched for two-factor structures to establish a final scale by comparing the goodness-of-fit of both scales using confirmatory factor analysis. We verified the convergent, discriminant, and criterion-related validities, and reliability of the new scale. Convergent validity was verified using the Average Variance Extracted (AVE) for each factor and its correlation with the Japanese ODS (Udris, 2016), which has been widely used to measure online disinhibition. Discriminant validity was verified by comparing the AVE with the squared inter-factor correlation. Criterion-related validity was verified through correlation with the MOD (Stuart & Scott, 2021). Reliability was verified through the α coefficient and composite reliability (CR) of each factor.

First survey

In the first survey, exploratory factor analysis was conducted to screen items and obtain clues to determine the factor structure of the scale.

Structure of the questionnaire　　The questionnaire was composed as follows:

1. We explained the purpose of the survey and obtained participants' consent to participate.
2. We asked participants about their Internet usage status.

Table 2   Exploratory factor analysis results (Structure A, Study 2)

Items		Factors			
		F1	**F2**	**F3**	**F4**
MMOD8	I don't think anyone will get back at me for saying whatever I like to others on the Internet.	**.69**	-.07	-.01	.04
MMOD3	On the Internet, even if I think I have done something that is not good, I will not feel so guilty.	**.65**	.03	.01	-.06
MMOD1	On the Internet, no matter what I do, it will not affect my real image too much.	**.53**	-.07	.05	-.02
MMOD21	On the Internet, I can behave as I like without the various restrictions of the real world.	**.49**	.13	.09	.04
MMOD11	On the Internet, I can shape trends of people or somethings as my wish.	**.45**	.11	-.04	.19
MMOD13	I feel that the people I interact with online have more similar values to me than acquaintances in the real world.	-.02	**.72**	.01	.00
MMOD12	I can encounter more people who meet my expectations online than in the real world.	.09	**.67**	-.07	-.06
MMOD14	There are people on the Internet who understand my frustrations and pain in the real world.	-.09	**.53**	-.02	.05
MMOD23	On the Internet, I can show a side that I don't want to show in real life.	.12	**.51**	.03	-.03
MMOD5	I can escape from the thin relationships on the Internet anytime.	.03	.01	**.81**	.00
MMOD25	If I don't want to continue a relationship with someone online, I can end it anytime.	-.01	.09	**.73**	-.07
MMOD6	My relationships on the Internet are shallow, and there are not many deep connections.	.04	-.21	**.45**	.08
MMOD17*	On the Internet, I am often mindful of how my words and actions may impact my relationships with friends and acquaintances.	-.01	.08	-.02	**.69**
MMOD19*	On the Internet, I always concern about how my family might perceive my words and actions.	.19	-.12	-.04	**.62**
MMOD16*	I often think carefully about whether my saying or doing in public on the Internet would be considered offensive.	-.34	.06	.12	**.43**
	Inter-factor correlation 1		.21	.30	-.49
	2			.00	-.10
	3				-.23

Note: MMOD: Multi-Dimensional Measure of Online Disinhibition

*: reverse item

3. The same instructions as those provided in the preliminary survey were used for the 25 items of the preliminary online disinhibition scale, and participants were asked to respond on a 6-point scale ranging from "1. Strongly disagree" to "6. Strongly agree." For items that were difficult to judge, such as those that did not match the respondents' Internet usage, we asked the participants to speculate on an answer. If they still could not answer, we asked them to select "I don't know". In addition, an attention-check item was included.

4. Twelve items from the MOD (Stuart & Scott, 2021) were translated into Japanese, with permission from the first author.

5. Participants were asked to respond to all 11 items of the Japanese version of the ODS (Udris, 2016) on a four-point scale ranging from "1. Does not apply" to "4. Applies."

6. Respondents were asked to provide information on age, gender, and educational attainment.

7. We asked for free comments and questions.

Participants On September 10, 2021, we commissioned Crowdworks to recruit approximately 500 participants. Assuming a response time of approximately 11 minutes, the compensation was 100 yen. A total of 539 respondents completed the questionnaires. Data from 71 subjects were deleted listwise based on the same criteria as those used in Study 1, resulting in data from 468 subjects (female = 316, M_{age} = 38.26, SD = 10.90).

Results No items exhibited ceiling or floor effects. Therefore, an exploratory factor analysis (maximum likelihood method and promax rotation) was performed for all items. While considering the constructs included in the preliminary scale, we considered 4- and 5-factor solutions with reference to a scree plot (Figure S1). As the 5-factor solution was found to be inappropriate, we adopted a 4-factor solution. Five items (MMOD2, MMOD7, MMOD20, MMOD22, and MMOD24) with absolute factor loadings of less than .40 for all factors were deleted.

Factor analysis was performed again on the remaining 20 items using a 4-factor solution. A simple structure was obtained (all items of one factor have an absolute factor loading of .40 or higher, while the other three factors do not have an absolute factor loading of .40 or higher). Next, to minimize the burden on respondents, three items were deleted. These were MMOD15 (had a double negative and was difficult to answer intuitively), MMOD10 (had a higher level of abstraction), and MMOD4 (with absolute value of factor loadings was lower than that of MMOD3, which had similar content).

Furthermore, exploratory factor analysis using the 4-factor solution was performed on 17 items, and two items (MMOD9 and MMOD18) with absolute factor loadings less than .40 were deleted. Exploratory factor analysis using a 4-factor solution was repeated. Thus, the structure listed in Table 2 (hereafter, Structure A) was obtained. Again, a simple structure was obtained; however, MMOD16 also had relatively high loadings for factor one, suggesting the possibility of multiple loadings. Therefore, we conducted a second survey and confirmatory factor analysis based on Structure A using data from new samples and confirmed the validity of the factor structure.

Second survey

Structure of the questionnaire and recruitment of participants The second questionnaire was prepared by excluding the ten items deleted from the first questionnaire. From September 17 to 19, 2021, we commissioned Crowdworks to recruit approximately 500 participants. Assuming that the response time was approximately 8–10 minutes, the compensation was 91 yen. In total, 567 participants responded to the questionnaire. Data from 92 participants were deleted listwise using the same criteria as those from the first survey, resulting in data from 475 respondents (310 female, M_{age} = 36.76, SD = 10.53).

Results The confirmatory factor analysis using Structure A (Table S4) showed the following fitness indices: Comparative Fit Index (CFI) of .85 (> .90, Harrington, 2009), Goodness of Fit Index (GFI) of .91 (> .90, Kano & Miura, 2020), Adjusted Goodness of Fit Index (AGFI) of .87 (> .90, Bagozzi & Yi, 1988), and Root Mean Square Error of Approximation (RMSEA) of .08 (0.077… < .08, Harrington, 2009; Lai & Green, 2016). The Akaike information criterion (AIC), Bayesian information

Table 3　Exploratory factor analysis results (Structure B, Study 2)

Items		Factors		
		F1	F2	F3
MMOD3	On the Internet, even if I think I have done something that is not good, I will not feel so guilty.	**.73**	.02	.02
MMOD8	I don't think anyone will get back at me for saying whatever I like to others on the Internet.	**.64**	-.07	-.03
MMOD16	I often think carefully about whether my saying or doing in public on the Internet would be considered offensive.	**-.55**	.10	.14
MMOD1	On the Internet, no matter what I do, it will not affect my real image too much.	**.47**	.03	.11
MMOD21	On the Internet, I can behave as I like without the various restrictions of the real world.	**.43**	.21	.09
MMOD13	I feel that the people I interact with online have more similar values to me than acquaintances in the real world.	-.05	**.74**	-.04
MMOD12	I can encounter more people who meet my expectations online than in the real world.	.05	**.70**	-.04
MMOD14	There are people on the Internet who understand my frustrations and pain in the real world.	-.13	**.61**	-.03
MMOD23	On the Internet, I can show a side that I don't want to show in real life.	.12	**.52**	.04
MMOD5	I can escape from the thin relationships on the Internet anytime.	-.04	-.01	**.86**
MMOD25	If I don't want to continue a relationship with someone online, I can end it anytime.	-.04	.11	**.71**
MMOD6	My relationships on the Internet are shallow, and there are not many deep connections.	.06	-.25	**.48**
	Inter-factor correlation　1		.26	.40
	2			.13

Note: MMOD: Multi-Dimensional Measure of Online Disinhibition

criterion (BIC), and Conditional Akaike Information Criterion (CAIC) were 393.94, 543.82, and 543.89, respectively. The indicators, except for GFI and CFI, were generally within acceptable limits. To assess convergent and discriminant validity, the AVE was calculated and found to be .32, .45, .48, and .30 (in order) for each factor, respectively. All these values are below the criteria of .50 for convergent validity. However, it exceeded the square of the correlation between any factor (maximum value: the square of the correlation coefficient of the first and fourth factors, .27); thus, its discriminant validity was confirmed (cf. Fornell & Larker, 1981). The internal consistency (α coefficient) of each factor was .68, .75, .69, and .56, respectively, with CR values of .69, .76, .72, and .56, respectively. All reliability indicators were generally low, particularly for the fourth factor.

　　Furthermore, we reviewed the item content at this stage and found problems with two items in the fourth factor (MMOD17 and MMOD19). Because both items ask how much the respondent's social network in the real-world influences what the respondent says and does online, the respondents may have different assumptions. Therefore, we removed MMOD17 and MMOD19, and performed an exploratory factor analysis with a 3-factor solution on 13 items using data obtained from 943 respondents by combining the first and second surveys. Subsequently, MMOD11 was deleted because its absolute factor loading was less than .40. Another exploratory factor analysis was conducted using a 3-factor solution for the remaining 12 items, resulting in Structure B (Table 3). To confirm the validity of Structure B, we collected additional data, and compared Structures A and B to determine the final factor

Table 4　Factor loadings for confirmatory factor analysis based on Structure B (Study 2)

	Items	F1	F2	F3	Mean	SD
		Factors			*Mean*	*SD*
MMOD3	On the Internet, even if I think I have done something that is not good, I will not feel so guilty.	.67			2.38	1.15
MMOD8	I don't think anyone will get back at me for saying whatever I like to others on the Internet.	.65			1.98	0.93
MMOD1	On the Internet, no matter what I do, it will not affect my real image too much.	.56			4.82	0.89
MMOD21	On the Internet, I can behave as I like without the various restrictions of the real world.	.53			2.79	1.11
MMOD16	I often think carefully about whether my saying or doing in public on the Internet would be considered offensive.	-.41			3.23	1.22
MMOD12	I can encounter more people who meet my expectations online than in the real world.		.77		3.59	1.10
MMOD13	I feel that the people I interact with online have more similar values to me than acquaintances in the real world.		.72		3.40	1.15
MMOD14	There are people on the Internet who understand my frustrations and pain in the real world.		.57		3.99	1.02
MMOD23	On the Internet, I can show a side that I don't want to show in real life.		.54		4.04	1.26
MMOD5	I can escape from the thin relationships on the Internet anytime.			.83	4.01	1.09
MMOD25	If I don't want to continue a relationship with someone online, I can end it anytime.			.60	4.28	1.05
MMOD6	My relationships on the Internet are shallow, and there are not many deep connections.			.49	4.07	1.13
	Inter-factor correlation　1		.18	.36		
	2			.06		

Note: MMOD: Multi-Dimensional Measure of Online Disinhibition

Table 5　The Indices of confirmatory factor analysis of Structure A and structure B (Study 2)

	CFI	GFI	AGFI	RMSEA	AIC	BIC	CAIC
Structure A	.85	.91	.87	.08	393.94	543.82	543.89
Structure B	.87	.94	.90	.08	255.70	367.42	367.48

structure.

Third survey

Structure of the questionnaire and recruitment of participants　The third questionnaire was prepared by excluding three items (MMOD11, MMOD17, and MMOD19) from the second questionnaire. We commissioned Crowdworks to recruit approximately 500 participants. Assuming that the response time was approximately 7–8 minutes, the compensation was set to 82 yen. A total of 550 respondents completed the questionnaire. Data from 87 participants were deleted list-wise based on the same criteria used previously, resulting in data from 463 participants (female = 301, M_{age} = 36.06, SD = 9.78).

Results　The confirmatory factor analysis results using Structure B are presented in Table 4. The fitness indices were as follows: CFI of .87, GFI of .94, AGFI of .90, RMSEA of .08, AIC of 255.70, BIC of 367.42, and CAIC of 367.48. Specifically, Structure B was also within the acceptable range when assessed using the same criteria as those used for Structure A, and its goodness-of-fit index was slightly better than that of Structure A (Table 5). The AVE of each factor was .33, .43, and .43 (in order). They

Table 6   Correlation analysis of MMOD and subfactors with other scales (Study 2)

	Mean	*SD*	MMOD	F1	F2	F3	MOD	ODS	BD	TD
MMOD	3.31	0.54	1.00							
F1	2.48	0.72	.78 **	1.00						
F2	3.72	0.85	.65 **	.20 **	1.00					
F3	4.14	0.86	.56 **	.27 **	.01	1.00				
MOD	2.65	0.66	.52 **	.41 **	.51 **	.06 *	1.00			
ODS	2.04	0.36	.55 **	.44 **	.47 **	.15 **	.69 **	1.00		
BD	2.50	0.47	.50 **	.32 **	.53 **	.11 **	.67 **	.94 **	1.00	
TD	1.24	0.35	.37 **	.48 **	.08 **	.14 **	.37 **	.60 **	.30 **	1.00

Note: MMOD: Multi-Dimensional Measure of Online Disinhibition, F1: unique perspective on the online environment; F2: changes of alienation cognition; F3: changes of relationship cognition; MOD: Measure of Online Disinhibition, ODS: Online Disinhibition Scale, BD: Benign Disinhibition, TD: Toxic Disinhibition.

** $p < .01$, * $p < .05$

were also below the standard value of .50 for convergence validity but higher than the square of the maximum correlation coefficient (.13 between Factor 1 and Factor 3). Furthermore, the α coefficient of each factor was .69, 0.74, and 0.66, and the CR was 0.70, 0.75, and 0.68. After comparing these values with those of Structure A, Structure B was considered the final factor structure for the MMOD. We named the three factors based on the categories set during the interview content analysis and creation of preliminary scale items, while considering how to best express changes in the cognitive perception of social phenomena. The first factor was named "Unique Perspective on the Online Environment," the second as "Changes in Alienation Perception," and the third as "Changes in Relationship Perception."

Next, we conducted descriptive statistics by creating composite variables for each factor in Structure B using data from 1403 respondents (a combination of the three surveys) as the object of analysis. The mean values for each factor were 2.48 (*SD* = 0.72), 3.72 (*SD* = 0.85), and 4.14 (*SD* = 0.86), respectively. The correlation coefficients were .20 between the first and second factors, .27 between the first and third, and .01 between the second and third. The α coefficient for all 12 items was .71 and the mean was 3.31 (*SD* = 0.54). Figures S2 and S3 show the overall scale, boxplots, and violin plots of each factor, and boxplots of the scores for each item.

To confirm the criterion-related and convergent validity, we calculated the correlation between the MMOD and three factors using the Japanese MOD (*M* = 2.65, *SD* = 0.66, α =.86), BD (*M* = 2.50, *SD* = 0.47, α =.66), TD (*M* = 1.24, *SD* = 0.35, α =.60), and ODS (*M* = 2.04, *SD* = 0.36, α =.69) (Table 6). Both the total MMOD score, and each factor were significantly positively correlated with the Japanese MOD, BD, TD, and ODS.

Discussion

Study 2 aimed to develop a MMOD and examine its validity and reliability. Based on the

preliminary measure of online disinhibition generated in Study 1, we compared the goodness of fit of two structures in the confirmatory factor analysis, examined the constructs using multiple survey data, and finally examined "unique perspective on the online environment," "changes of alienation cognition," and "changes of relationship cognition." The CFI was slightly lower than the standard value of 0.90 because of the weak correlation between the factors. However, people's cognitions of enormous social phenomena are inherently complex and not necessarily assumed to have a high degree of relevance. Therefore, a slightly lower CFI does not significantly compromise the validity of this measure (Lai & Green, 2016). Although the internal consistency (α coefficient) of each factor was not sufficiently high overall, the CR was within the acceptable range ($\geq$.60) (cf. Bagozzi & Yi, 1988). Nevertheless, this study aimed to examine online disinhibition in detail by focusing on the human cognition of extremely large and complex social phenomena. Therefore, it was considered important to gather meaningful items, even if it meant sacrificing reliability (cf. Murayama, 2012, p. 124).

When examining the convergent validity of the scale, we found that the AVE of each factor was slightly lower than the standard value; however, in the correlation analysis with the ODS, the score of the MMOD and each factor were significantly positively related with the ODS, and its subfactors BD and TD. Although some ODS items have limitations in terms of the construct's rigor (Stuart & Scott, 2021; Wen & Miura, 2022/2023), the scale has been widely employed in psychological research and is generally accepted as a measure of experience with "online disinhibition." Therefore, the significant correlation between the MMOD and ODS can be considered evidence of convergent validity. However, because a floor effect was observed in the TD, the results of the rank correlation analysis of the TD with the MMOD, MMOD, ODS, and BD are presented in Table S6. Furthermore, the AVE was higher than the squared correlation coefficient between each factor, indicating that the three factors in this scale were distinct and could be differentiated as separate constructs.

Finally, these three factors were significantly positively correlated with MMOD. Therefore, the MMOD can measure the mental states of online disinhibition more comprehensively based on the perception of social phenomena and has the same validity as the MOD.

4. General Discussion

Significance of this research

We developed a measurement for the mental states of online disinhibition based on the identification of various social phenomena that may be involved in online disinhibition and confirmed its validity and reliability. In Study 1, semi-structured interviews were conducted to generate several online disinhibition items. In Study 2, a preliminary scale was used to develop a final version of the MMOD which is both user-friendly and multifaceted through exploratory and confirmatory factor analyses. MMOD and MOD were significantly correlated, indicating adequate criterion-related validity.

MMOD measures online disinhibition via three factors: "unique perspective on the online environment," "changes of alienation cognition," and "changes of relationship cognition." This is the

most important distinguishing feature from the MOD, which has a single-factor structure. This structure is expected to facilitate more in-depth exploration of online disinhibition. Each item on the scale implies changes in the cognition of specific social phenomena that accompany changes in mental state, as measured by the MOD.

The first factor, "unique perspective on the online environment," includes items that span five of the eight categories that were initially set and measures cognitions of various social phenomena that humans form in the real world, immoral perception, result of behavior, cognition of self-image, cognition of rules, and empathy for others, which are believed to decline in the online environment. This factor captures a broad range of meanings that are consistent with people's general impressions of the online environment, such as the divergence between the images of the online and real worlds, and the fact that certain norms of the real world may not apply in the online world. Specifically, MMOD1 is related to people's cognition of their own identity and reflects the ambiguity of social identity due to the "anonymity" and "invisibility" of the online environment noted by Suler (2004). MMOD3 and MMOD16 indicate the difficulty of perceiving the other person's reactions and feelings in a highly "invisible" online environment, as pointed out by Suler (2004), and the decline in empathy in the online environment, as pointed out by Terry and Cain (2016). MMOD8 indicates the change in social influence due to "anonymity" and "minimization of status and authority," as pointed out by Suler (2004). It is also related to the phenomenon of making irresponsible and defamatory remarks about others on the Internet (cf. Ministry of Internal Affairs and Communications, 2020). Moreover, the fact that one can unilaterally say something and escape aligns with Suler's point about "asynchrony." MMOD21 indicates the "dissociative imagination" that Suler pointed out, wherein social norms become irrelevant online. These five items are grouped as one factor and represent the extent to which "the online environment is regarded as a space different from the real world." With this measure, it is possible to precisely analyze the cognitive changes that underlie deviant online behavior (e.g., celebrity slurs) and accurately capture key issues. This is a significant improvement over the MOD, which only assesses whether Internet users "act tougher/be more assertive" or "act or say differently from offline."

The second factor, "changes of alienation cognition," measures the extent to which the cognition of others' alienation changes online. This factor reflects the public's favorable impressions of the online environment, such as, "Because the online environment has a relaxed atmosphere and people can be frank and kind to each other, making it easier to get to know each other." This is generally considered the product of "anonymity" and "invisibility." Each item is consistent with the attractiveness of online communication ("self-presentation," "similarity," "self-disclosure and complementarity," and "idealization") as organized by Joinson (2002/2004). Specifically, because of the anonymity and invisibility of online communication, non-verbal cues (e.g., appearance, voice, and gaze), which are crucial for forming impressions, cannot be conveyed to the other person immediately during the interaction. On the one hand, the sender of a message can selectively and strategically present them during the communication process (MMOD23). On the other hand, one can selectively choose messages from others using the search function on social media, making it easier to meet people with the same

interests and values (MMOD13). Furthermore, because text communication is the dominant form of communication on the Internet, it promotes self-disclosure and complementarity (MMOD14 and MMOD23), thereby leading to idealization of the other party (MMOD12, overall factor 2) (cf. Kato, 2013). Therefore, the second factor measures the attractive aspects of online interaction more precisely than the MOD.

The third factor, "changes of relationship cognition," measures the extent to which the perceived online interpersonal vulnerability changes. This factor indicates that people may consider it acceptable to escape from the interpersonal relationships on the Internet. Suler (2004) noted that this can be the result of the interaction between "dissociative imagination" and "solipsistic introjection." In the real world, interpersonal networks are complexly intertwined, and can have long-lasting and far-reaching consequences. However, this is not necessarily the case on the Internet. Consequently, people may feel their inhibition of interpersonal aspects is reduced on the Internet. It should be noted that the third factor is the opposite of the second factor and that the two are almost uncorrelated. In addition, the correlation coefficient between the third factor and MOD was very low. The positive characteristics of the online environment, such as its ability to facilitate deeper social bonds and the easy resolution of interpersonal problems with its relaxed atmosphere, have received widespread attention. However, seemingly close social ties can be abruptly severed because human relationships built on the Internet lack substantive relationships (e.g., interests). This characteristic of online interpersonal relationships was highlighted by Suler (2004) but has not been addressed in the MOD. The presence of both the second and third factors in the MMOD indicates the complexity of the mental state of online disinhibition and related cognition, providing a more detailed understanding of the characteristics of online interpersonal relationships than the MOD.

Limitations and perspectives

This study has some limitations. First, we have not sufficiently verified construct validity (convergent and discriminant validity). In this study, we developed a three-factor scale as an improvement over the MOD and examined its convergent and discriminant validity through confirmatory factor analysis. Furthermore, we examined the scale's convergent validity through correlation analysis with the ODS and its subfactors. However, the validity of the three newly discovered subfactors of the MMOD has not been fully established. For example, we have not yet verified the relationships between the objective characteristics of the online environment (such as anonymity and invisibility), and related cognitions and mental states of disinhibition. Thus, to verify the construct validity of the structure, further investigations are needed on the relationships between MMOD and the characteristics of the online environment, such as the six factors of online disinhibition identified by Suler (2004).

Second, because this scale emphasizes high versatility and aims to be used as a measurement scale for online disinhibition in general online settings, we omitted items that included expressions that limited specific settings in the CMC. Therefore, this scale may not be suitable for measuring disinhibition, which depends specifically on the characteristics of certain services, such as online games and social

media, or specific devices, such as smartphones. However, the Internet Addiction Test (Young, 1998), which is used globally, has been adapted to measure addiction to online games (Demetrovics, Urbán, Nagygyörgy, Farkas, Griffiths, Pápay, Kökönyei, Felvinczi, & Oláh, 2012), social media (Wu, Cheung, Ku, & Hung, 2013), and smartphones (Toda, Nishio, & Takeshita, 2015). This scale was developed by conducting interviews with many Internet users and aimed to comprehensively examine online disinhibition in various Internet usage situations and capture the underlying mental processes from multiple perspectives. By substituting specific services and terminals, we believe that it is possible to measure and compare common forms of online disinhibition across situations.

Third, this scale may not be fully adequate for measuring the mental state of online disinhibition and related cognition. On the one hand, biases stemming from cultural differences in the collected narratives and the variability in the attributes of the survey samples may have impacted the factor structure and item groups comprising each factor. Therefore, we cannot deny that some important constructs that constitute online disinhibition may not be included in this scale. On the other hand, the two characteristics of "dissociative imagination" and "solipsistic introjection" (Suler, 2004), related to the decline in social reality in virtual online societies, are rather abstract concepts. Consequently, it is difficult to express these constructs in a plain and simple way and ask participants to evaluate them. It would be desirable to confirm the validity of the scale structure by comparing cultural differences and exploring methods for measuring abstract concepts together with clinical and personality psychology.

Finally, we lacked the means to identify low-quality responses. Individuals who respond to online surveys are more likely to experience "online disinhibition," which can lead to unreliable responses. In this study, we used attention check items to confirm the minimization of effort (Miura & Kobayashi, 2018); however, we were unable to identify respondents who intentionally distorted or provided fraudulent responses. Future works should consider methods for identifying such low-quality responses.

Using the MMOD to measure online disinhibition has the potential to address several unresolved challenges. For example, the relationship between anonymity in online environments and online disinhibition, which has not been consistently understood thus far (e.g., Clark-Gordon, Bowman, Goodboy, & Wright, 2019), can be examined using this scale from a multi-dimensional perspective. This may provide us with concrete insights into how anonymity affects different subfactors of disinhibition and potentially offer more convincing evidence. Moreover, through empirical examination of models such as the "Motivation-based Online Disinhibition Model" proposed by Wen and Miura (2022/2023), or the "Online Disinhibition-Behavior Model" generalized by Kurek, Jose, and Stuart (2019) and Stuart and Scott (2021), we can contribute to the development of more sophisticated theoretical models that link the mental state of online disinhibition to disinhibitive behavior.

Conflicts of interest

The authors have no conflicts of interest to declare.

Notes

1) This study was conducted with the support of the Telecommunications Advancement Foundation's research grant, "Reconsidering Online Disinhibition: Development of new measures and examination of mechanisms" (principal investigator: Asako Miura). We express our gratitude for their support.

2) The figures and tables numbered S are provided as appendices in the Open Science Framework: https://osf.io/uab5e/

3) We would like to express our sincere gratitude to Zhao Xinyu for her support in analyzing the content of the interviews and generating the items.

4) Chinese youths were selected for the semi-structured interviews because it was judged appropriate to conduct the interviews in the native language of the first author would help in collecting more accurate and detailed information. In the next phase of items generation, we focused only on "cognition of social events" and aimed to create items that were not overly dependent on specific situations. Consequently, the influence of specific forms of Internet users based on nationality or age were excluded as "specific situations." Furthermore, these items were refined to target the Japanese people. Considering this process of item generation, the approach of targeting young Chinese with extensive experience in online environments and conducting interviews in the interviewer's native language was convenient and effective in this study. Therefore, although the participants in interviews had biased attributes, we believe that we obtained sufficient quality data to fully reflect the actual state of online disinhibition. The collection of basic information from young people is a common approach in previous studies, such as Stuart and Scott (2021), who developed the MOD. The average age of participants in the group discussion in Stuart and Scott (2021) was 25.70 (SD = 5.56).

5) Because Suler (2004) pointed out the relationship between online disinhibition and personality traits, we included the TIPI-J in this survey. However, we do not mention the results as exploring this relationship was not the purpose of this study.

6) We calculated the compensation amount for research cooperation at a unit price of JPY 500 per hour.

7) However, among the items for which the absolute value of all factor loadings was 0.35 for any solution, "What I talk or act online are not bound by social status or position in the real world" is closely related to the anonymity of the online environment. Because anonymity is one of the key causes of online disinhibition identified by Suler (2004) and has attracted significant attention, we decided to retain this item because we believe it is crucial for measuring online disinhibition.

References

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*, 74–94. https://doi.org/10.1007/BF02723327

Barak, A., Boniel-Nissim, M., & Suler, J. (2008). Fostering empowerment in online support groups.

Computers in Human Behavior, 24 (5), 1867–1883. https://doi.org/10.1016/j.chb.2008.02.004

Clark-Gordon, C. V., Bowman, N. D., Goodboy, A. K., & Wright, A. (2019). Anonymity and online self-disclosure: A meta-analysis. *Communication Reports, 32* (2), 98–111. https://doi.org/10.1080/08934215.2019.1607516

Demetrovics, Z., Urbán, R., Nagygyörgy, K., Farkas, J., Griffiths, M. D., Pápay, O., Kökönyei, G., Felvinczi, K., & Oláh, A. (2012). The development of the problematic online gaming questionnaire (POGQ). *PloS One, 7* (5), e36417. https://doi.org/10.1371/journal.pone.0036417

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18* (1), 39–50. https://doi.org/10.1177/002224378101800104

Gorsuch, R. L. (1983). *Factor analysis*. (2nd ed.) Hillsdale, NJ: Lawrence Erlbaum.

Harrington, D. (2009). *Confirmatory factor analysis*. Oxford University Press.

Joinson, A. N. (2004). Understanding the psychology of Internet behaviour: Virtual worlds, real lives (Miura, A., Azechi, S., & Tanaka, A. Trans.). Kitaohji Shobo. (Original work published 2002).

Kano, Y. & Miura, A. (2020). *Graphical Tahenryo Kaiseki (New Edition)*. Gendai Sugakusha.

Kato, C. (2013). Processes about online-dating of adolescent girls: Based on semi-structured interviews of fifteen girls' junior and senior high school students. *The Society of Socio-Informatics, 2* (1), 45–57. https://doi.org/10.14836/ssi.2.1_45 (In Japanese with English abstract)

Kurek, A., Jose, P. E., & Stuart, J. (2019). 'I did it for the LULZ': How the dark personality predicts online disinhibition and aggressive online behavior in adolescence. *Computers in Human Behavior, 98*, 31–40. https://doi.org/10.1016/j.chb.2019.03.027

Lai, K., & Green, S. B. (2016). The problem with having two watches: Assessment of fit when RMSEA and CFI disagree. *Multivariate Behavioral Research, 51* (2–3), 220–239. https://doi.org/10.1080/00273171.2015.1134306

Ministry of Internal Affairs and Communications (2020). Policy package for addressing online defamation and harassment. Retrieved from https://www.soumu.go.jp/main_content/000704625.pdf (In Japanese)

Miura, A., Kobayashi, T. (2018). Influence of satisficing on online survey responses. *Behaviormetrika, 45* (1), 1–11. https://doi.org/10.2333/jbhmk.45.1 (In Japanese with English abstract)

Murayama, K. (2012). Validity : Historical and psychometric perspectives. *The Annual Report of Educational Psychology in Japan, 51*, 118–130. https://doi.org/10.5926/arepj.51.118 (In Japanese with English abstract)

Oshio, A., Abe, S., & Cutrone, P. (2012). Development, reliability, and validity of the Japanese version of Ten Item Personality Inventory (TIPI-J). *Japanese Journal of Personality, 21* (1), 40–52. https://doi.org/10.2132/personality.21.40 (In Japanese with English abstract)

Paciello, M., Tramontano, C., Nocentini, A., Fida, R., & Menesini, E. (2020). The role of traditional and online moral disengagement on cyberbullying: Do externalising problems make any difference? *Computers in Human Behavior, 103*, 190–198. https://doi.org/10.1016/j.chb.2019.09.024

Schouten, A. P., Valkenburg, P. M., & Peter, J. (2007). Precursors and underlying processes of adolescents' online self-disclosure: Developing and testing an "Internet-attribute-perception" model. *Media Psychology, 10* (2), 292–315. https://doi.org/10.1080/15213260701375686

Shimizu, H. (2016). An introduction to the statistical free software HAD: Suggestions to improve teaching, learning and practice data analysis. Journal of Media, *Information and Communication, 1,* 59–73. http://jmic-weblab.org/ojs/index.php/jmic/article/view/6 (In Japanese with English abstract).

Shimizu, K. (2018). Misuse and artifact in factor analytic research. *Bulletin of the Faculty of Sociology, Kansai University. 49* (2), 191–211. http://hdl.handle.net/10112/13343 (In Japanese with English abstract).

Stuart, J., & Scott, R. (2021). The measure of online disinhibition (MOD): Assessing perceptions of reductions in restraint in the online environment. *Computers in Human Behavior, 114*, 106534. https://doi.org/10.1016/j.chb.2020.106534

Suler, J. (2004). The online disinhibition effect. Cyberpsychology & behavior, *7* (3), 321–326. https://doi.org/10.1089/1094931041291295

Terry, C., & Cain, J. (2016). The emerging issue of digital empathy. *American Journal of Pharmaceutical Education, 80* (4). https://doi.org/10.5688/ajpe80458

Toda, M., Nishio, N., & Takeshita, T. (2015). Development of a new scale for gauging smartphone dependence. *Japanese Journal of Hygiene, 70* (3), 259–263. https://doi.org/10.1265/jjh.70.259 (In Japanese with English abstract.)

Udris, R. (2014). Cyberbullying among high school students in Japan development and validation of the online disinhibition scale. *Computers in Human Behavior, 41*, 253–261. https://doi.org/10.1016/j.chb.2014.09.036

Udris, R. (2016). *Cyberdeviance among adolescents: Analyzing the online-offline overlap and predictors of deviant behavior* (Doctoral dissertation). Osaka University, Osaka. https://doi.org/10.18910/56042

Wen, R., & Miura, A. (2023) Online disinhibition: Reconsideration of the construct and proposal of a new model (Wen, R., & Miura, A., Trans.). *Osaka Human Sciences, 9*, 63–80. https://osf.io/n7ycu (Original work published 2022)

Wu, A. M., Cheung, V. I., Ku, L., & Hung, E. P. (2013). Psychological risk factors of addiction to social networking sites among Chinese smartphone users. *Journal of Behavioral Addictions, 2* (3), 160–166. https://doi.org/10.1556/jba.2.2013.006

Wu, S., Lin, T. C., & Shih, J. F. (2017). Examining the antecedents of online disinhibition. *Information Technology & People, 30* (1), 189–209. https://doi.org/10.1108/ITP-07-2015-0167

Young K. S. (1998). *Caught in the Net: How to recognize the signs of Internet addiction and a winning strategy for recovery*. New York, NY: Wiley.