Development of the Japanese version of the Kinesthetic and Visual Imagery Questionnaire (KVIQ)

Motor imagery is commonly defined as the mental simulation of one's own performance without any associated overt movement (Jeannerod M, et al. Behav Brain Sci. 1994). Previous studies have suggested that motor imagery increases motor skill acquisition and muscle strength in healthy participants (Pascual-Leone A, et al. J Neurophysiol. 1995; Yue G, et al. J Neurophysiol. 1992). Moreover, we have reported that motor imagery is an effective rehabilitation tool for patients with various diseases involving the central nervous system or acute injuries requiring orthopedic interventions (Nakano H, et al. Int J Clin Res Trials. 2018; Kodama T, Nakano H, et al. Clin EEG Neurosci. 2019; Nakano H, et al. Rigakuryoho Kagaku. 2010). Regarding the neural mechanisms, we have shown that the motor imagery shares the activation of cortical neural networks implicated in movement execution (Nakano H, et al. J Nov Physiother 2012).

	KVIQ-20		KVIQ-10	
	Visual	Kinesthetic	Visual	Kinesthetic
Cronbach α	0.88	0.91	0.78	0.77
95% CI	0.80–0.94	0.85–0.95	0.64–0.89	0.62–0.88
SEM	1.08	1.21	0.58	0.53
MDC	2.99	3.35	1.61	1.47

KVIQ-20 or 10, Kinesthetic and Visual Imagery Questionnaire - long (20 items) or short (10 items); CI, Confidence interval; SEM, Standard error of measurement, MDC, Minimal detectable change.

Tab. 1. Internal consistency of the KVIQ-20/KVIQ-10.

The Kinesthetic and Visual Imagery Questionnaire (KVIQ) is a representative tool to assess motor imagery ability (Malouin F, et al. J Neurol Phys Ther. 2007). The KVIQ can be used to assess healthy individuals, as well as those with physical disabilities. It allows easy evaluation of motor imagery ability in a sitting position with single joint motions. Furthermore, the KVIQ assesses both visual and kinesthetic dimensions of motor imagery. The KVIQ is not self-administered, rather it is administered by a trained assessor. It assesses the vividness of each dimension of motor imagery (clarity of the image/intensity of sensation) on a 5-point ordinal scale. There are multiple versions of the KVIQ, including the KVIQ-20, which consists of 20 items (10 items each for visual and kinesthetic subscales), and the short version, KVIQ-10, which is a subset of the KVIQ-20, consisting of 10 items (5 items each for visual and kinesthetic subscales). Globally, both the KVIQ-20 and KVIQ-10 are widely used to evaluate motor imagery ability (Braun S, et al. Front Hum Neurosci. 2013; Wondrusch C, et al. Front Hum Neurosci. 2013; Malouin F, et al. Front Hum Neurosci. 2013), and they have already been translated into German (Schuster C, et al. BMC Med Res Methodol. 2012). However, the KVIQ has not yet been adopted for Japanese speakers.

Developing a Japanese version of the KVIQ is important to promote motor learning strategies focused on motor imagery, and to contribute to treatment for Japanese individuals with physical disabilities.

In the present work, we aimed to translate the English version of the KVIQ into Japanese, and to investigate the reliability and validity of the new Japanese version of the KVIQ in healthy individuals. We used Cronbach's alpha coefficients to assess reliability reflected by the internal consistency. Additionally, we assessed validity reflected by the criterion-related validity between the Japanese KVIQ and the Japanese version of the Movement Imagery Questionnaire-Revised (MIQ-R) with Spearman's rank correlation coefficients.

We investigated internal consistency with Cronbach's alpha coefficients as an index of reliability. The results resembled assessments of internal consistency of the original KVIQ-20/KVIQ-10, which have been previously reported (Malouin F, et al. J Neurol Phys Ther. 2007). Therefore, our results indicate that the KVIQ-20/KVIQ-10 are highly reliable indices of motor imagery ability.

We also investigated criterion-related validity between the KVIQ and the MIQ-R as an index of validity. We observed significant positive correlations between the visual, kinesthetic, and total scores of the KVIQ-20 and the MIQ-R. Similar positive correlations were observed between the visual, kinesthetic, and total scores for the KVIQ-10 and the MIQ-R. The MIQ-R was developed to assess motor imagery abilities in healthy individuals and athletes (Hall CR, et al. J Ment Imagery. 1997; Williams SE, et al. J Sport Exerc Psychol. 2012; Battaglia C, et al. Hum Mov Sci. 2014). Previous research has indicated significant positive correlations between the KVIQ and MIQ-R subscales and total scores, similar to our results (Randhawa B, et al. J Neurol Phys Ther. 2010; Malouin F, et al. Arch Phys Med Rehabil. 2010). Therefore, our results indicate that the KVIQ is a highly valid index of motor imagery abilities.

Variable	Correlation Coefficient (r)	*p*-Value
KVIQ-20 Visual—MIQ-R Visual	0.64	<0.01
KVIQ-20 Kinesthetic—MIQ-R Kinesthetic	0.77	<0.01
KVIQ-20 Total—MIQ-R Total	0.86	<0.01
KVIQ-10 Visual—MIQ-R Visual	0.62	<0.01
KVIQ-10 Kinesthetic—MIQ-R Kinesthetic	0.78	<0.01
KVIQ-10 Total—MIQ-R Total	0.90	<0.01

KVIQ-20 or 10, Kinesthetic and Visual Imagery Questionnaire—long (20 items) or short (10 items); MIQ-R, Movement Imagery Questionnaire-Revised.

Tab. 2. Spearman's rank correlation coefficients between scores for the KVIQ-20/KVIQ-10 and the MIQ-R.

In conclusion, our results suggest that the Japanese KVIQ is an assessment that is a reliable and valid index of motor imagery ability. Moreover, the Japanese KVIQ could contribute to treatment for Japanese individuals with physical disabilities.

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Publication

Reliability and Validity of the Japanese Version of the Kinesthetic and Visual Imagery Questionnaire (KVIQ).
Nakano H, Kodama T, Ukai K, Kawahara S, Horikawa S, Murata S
Brain Sci. 2018 May 2