

1 Skewness and kurtosis: relation between Cain et al. (2017) and the package ‘PearsonDS’

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Abstract

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11 Skewness and kurtosis: relation between Cain et al. (2017) and the package ‘PearsonDS’

12 In 2017, Cain et al. have conducted a review assessing the skewness and kurtosis of  
 13 articles in recent psychology and education publications. They used the following formulas of  
 14 Fisher’s skewness ( $G_1$ ) and kurtosis ( $G_2$ ):

$$G_1 = \frac{\sqrt{n(n-1)}}{n-2} \frac{m_3}{\sqrt{(m_2)^3}} \quad (1)$$

15 With  $n$  = sample size,  $m_2$  = second centered moment and  $m_3$  = third centered  
 16 moment.

$$G_2 = \frac{n-1}{(n-2)(n-3)} \times [(n+1)(\frac{m_4}{(m_2)^2} - 3) + 6] \quad (2)$$

17 with  $n$  = sample size and  $m_2$  and  $m_4$  = the second and fourth centered moments. I  
 18 chose to use this article in order to define which value of skewness and kurtosis I would  
 19 simulate, in order to test the goodness of different measures of effect sizes under realistic  
 20 population parameter values. In my simulations, I Chose the function “rPearson” from the  
 21 package “PearsonDS”, in which skewness and kurtosis are computed as following:

$$skewness = \frac{m_3}{\sqrt{(m_2)^3}} \quad (3)$$

$$kurtosis = \frac{m_4}{(m_2)^2} \quad (4)$$

22 In order to simulate a sample extracted from a population where  $G_1 = X$ , using the  
 23 “rPearson” function, I need to make the following transformation:

$$\frac{\sqrt{n(n-1)}}{n-2} \frac{m_3}{\sqrt{(m_2)^3}} = X \iff \frac{m_3}{\sqrt{(m_2)^3}} = \frac{X(n-2)}{\sqrt{n(n-1)}} \quad (5)$$

<sup>24</sup> In order to simulate a sample extracted from a population where  $G_2 = X$ , using the  
<sup>25</sup> “rPearson” function, I need to make the following transformation:

$$\frac{n-1}{(n-2)(n-3)} [(n+1)(\frac{m_4}{(m_2)^2} - 3) + 6] = X \iff \frac{m_4}{(m_2)^2} = \frac{X(n-2)(n-3) - 6(n-1)}{n^2 - 1} + 3 \quad (6)$$