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TWIN RESEARCH 4 - Part B: Twin Psychology and Behavior Genetics  
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## Does a Special Twin Situation Contribute to Similarity for Abilities in MZ and DZ Twins?

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**Abstract.** Evidence for and against the validity of the assumption of equal environments for MZ and DZ twins is reviewed, and the consequences of possible violations of the assumption are considered. Further methods of testing the validity of the assumption, as well as possible means of correcting in part for violations, are suggested.

**Key words:** Mental ability, Equal environments, Twin situation

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The classical twin study consists of a comparison of the concordance or degree of within-pair similarity of identical (MZ) and fraternal (DZ) twins. One of the necessary assumptions of this method is that the environmental conditions are similar for the two types of twins. This does not mean that the conditions have to be the same for all pairs, but only that the means and variances of any environmental effect be the same for the MZ and DZ twins.

A special "twin situation" has often been mentioned as a violation of the above assumption and has been invoked as a partial explanation for the similarity of twins, especially of identical twins. There are indeed reports that MZ twins more often have the same friends and are more often mistaken for each other, and there have been reports of other events that may give twins a sense of being part of a pair rather than being separate individuals. The question is whether such things contribute to twin similarity or whether they are not the cause, but the consequence, of the similarity.

I have earlier reported the absence of a relationship between 28 items that may be regarded as indices of the closeness of members of a twin pair to one another and the six scores of the Primary Mental Abilities (PMA) test battery [2]. In that report, all of the twins, whether they were MZ or DZ, were grouped together. The present analysis looked at these relationships separately for the MZ and the DZ twins.

The data are from the Michigan Twin Study [1] in which 45 MZ pairs and 37 DZ pairs took part. Besides an extensive battery of tests, the twins and their mothers filled

out a special questionnaire that attempted to assess the degree to which a special “twin situation” might exist for each pair. Ideas for these questions came from the various reports that twins are dressed alike, especially when they are MZ, that MZ more often than DZ have the same friends, share the same interests, and so on. A book by René Zazzo [3] called “Les Jumeaux, le Couple et la Personne” was particularly informative in this respect. A list of topics for the 28 questions used in this analysis is shown in the Table. Answers to only seven of the items differed significantly between MZ and DZ twins. These seven items are indicated by an asterisk in the Table. The 28 indices correlated moderately. The sum of the squared loadings in a factor analysis is also shown for each item. Although no interpretable factors resulted from rotation of the centroid factors, the sizes of the communalities suggest that the items measure the same attribute, “twinness”, to some extent.

All 28 questions were correlated with each of the six PMA scores (number ability, verbal ability, spatial ability, word fluency, reasoning, and memory) to produce 168 correlations. All of the questions were indications of a pair being seen or treated as a unit, either by themselves or by the mother, or acting as a unit. Several questions were worded

Table. Questions Concerning “Twinness”

Question	Answer	Estimated Communality
Questions asked of mother		
1. Are the twins emotionally attached to each other?	Strongly	0.49
* 2. Do the twins have the same friends at this time?	Share all friends	0.42
3. Do the twins argue a lot or not?	A lot	0.33
* 4. Do the twins try to be different from one another? (R)	No	0.54
* 5. Up to what age were the twins dressed alike?	Late	0.68
6. Has one of the twins ever told you that they should not be dressed the same any more? (R)	No	0.39
7. Did you dress the twins the same before that?	Yes	0.34
8. Do the twins still dress alike?	Yes	0.63
Questions asked of each twin		
9. Does one twin eat more?	No	0.30
*10. Does one twin go to bed later?	No	0.35
11. Percentage of things reported owned together (as marked on list of 40 items often owned by teenagers of either sex)	Higher percentage	0.25
*12. Difference in athletic activity? (R)	Low	0.54
13. Difference in athletic ability? (R)	Low	0.53
14. Joint ownership of dog?	Yes	0.17
15. Father says “the twins”? (R)	Yes	0.55
16. Mother says “the twins”? (R)	Yes	0.55
17. Feeling when mistaken for twin?	Pleased or amused vs. annoyed	0.29
18. Some close friends as twin?	Yes	0.42
*19. Go to movies together?	Yes	0.40
*20. Reported differences between self and twin on list of attributes and behaviors	Low total	0.59
21. What does twin do when parent scolds you?	Support twin vs. take parent’s side	0.72
22. What do you do when parent scolds twin?	Support twin	0.70
23. Would you rather be a single child or a twin?	Twin	0.40
24. Would you like to have twin children when you are married?	Yes	0.44
25. Number of reported differences in activities (on list of 20 possibilities)	Low total	0.47
26. Who do you talk with when troubled? (R)	Twin	0.31
27. Can you tell how your twin feels?	Yes	0.29
28. Does your twin understand you pretty well?	Yes	0.39

\*Answers differed significantly ( $P < 0.05$ ) between MZ and DZ twins

in the opposite direction, but these were reversed before the analysis. As a consequence, the hypothesis that a special twin situation contributes to twin similarity would lead to the expectation of mainly negative correlations. That is to say, whenever an increase in the "twinness" occurred, we would expect a decrease in the twin difference in ability. Four of the six PMA scores gave evidence of an hereditary component. Using Falconer's formula,  $h^2 = (r_{MZ} - r_{DZ})$ , the values were: number ability, 0.60; verbal ability, 0.28; spatial ability, 0.52; and word fluency, 0.66.

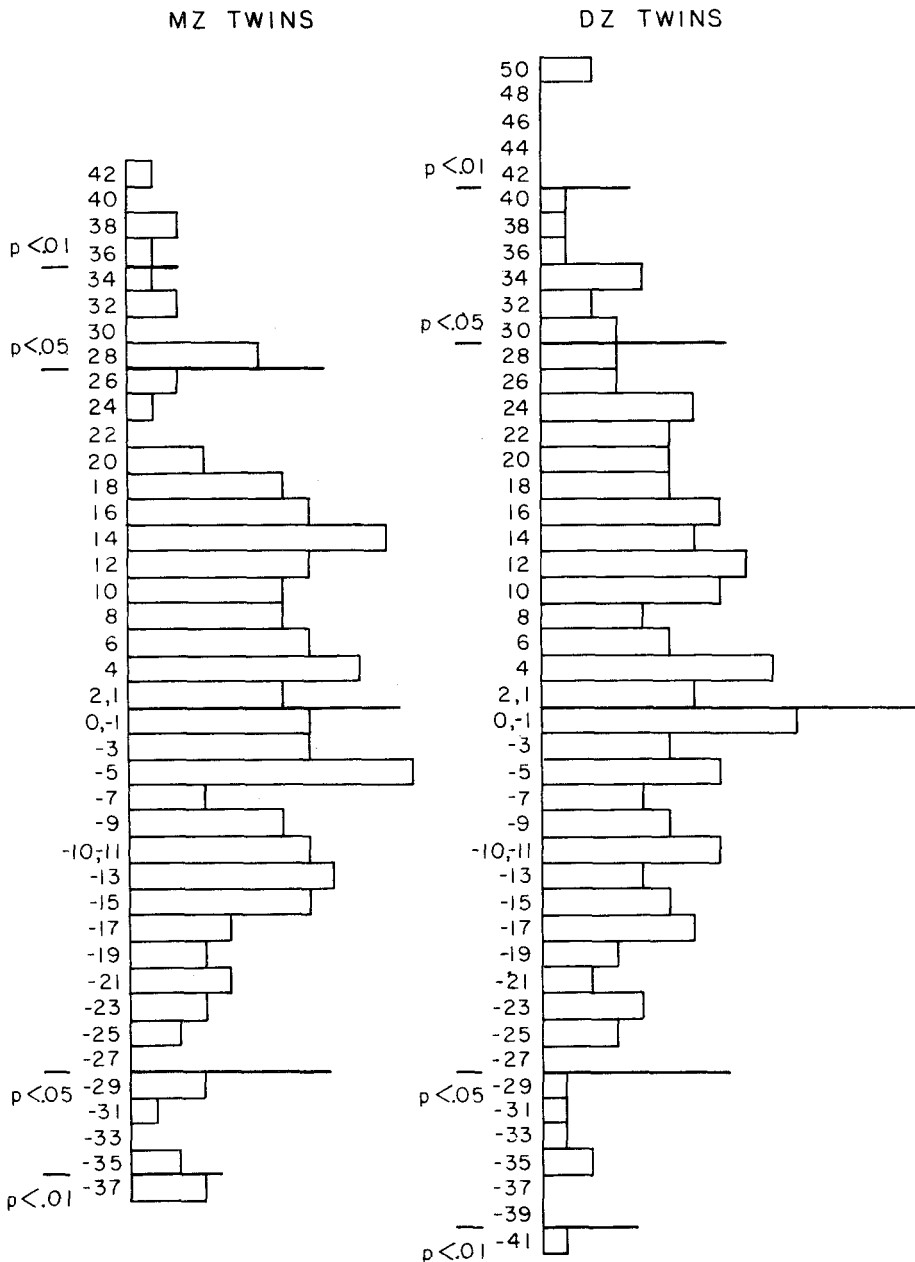


Figure - Distributions of 168 correlations between 28 "twinness" indices and 6 pair differences on PMA scores for 45 MZ twins (on the left) and 37 DZ twins (on the right).

The left side of the Figure shows the distribution of the 168 correlations for the MZ twins. It can be seen immediately that there are as many positive as negative correlations. In fact, the distribution resembles closely the distribution expected for random replications of a zero correlation. There was only a slight increase in the number of correlations significant at the 5% and 1% levels over what would be expected by chance, especially if only the tail at the negative side is considered. Thus, for the MZ twins, we are justified in concluding that the answers to the 28 questions provide no support whatever for an influence of a special twin situation on similarity in mental ability.

The same data for the DZ twins are shown on the right side of the Figure. It can be seen that this distribution of correlations is very similar to that for the MZ twins. This is the case even though the PMA differences were larger and answers to the twin questionnaire were somewhat less often indicative of "twinness". It would seem that most of the characteristics of twins, especially MZ twins, such as having the same friends, do not cause greater similarity, but are the result of prior similarity. It may be very difficult to produce positive evidence of this, rather than the negative evidence reported here. Even longitudinal research can only allow us to observe whether or not a relationship such as we looked for occurs perhaps earlier in life. Short of placing selected twins in different classrooms, all one can observe is correlations or their absence.

In a final effort, multiple correlations were calculated between the 28 indices of twinness and each of the six PMA scores separately. A program was used that selects the variable that correlates highest, then selects the variable that adds the most to the prediction, and so on. Not only were the combinations of variables selected different for each of the six ability scores, but in addition no multiple correlation was significant. When these analyses were performed separately for the male MZ and female MZ twins, the combinations were never replicated and were never significant. Most significance levels were close to 0.50 as a matter of fact. This finding is in part a result of the fact that the indices correlated very poorly, within each zygosity group, almost as if these were chance events. Yet, a number of the questions referred to factual matters such as how long the twins were dressed alike, whether they have the same or different friends, etc.

It might be interesting to repeat this analysis for personality variables, because it might be argued that the twin situation does not affect ability differences as much as it does personality. However, the complete absence of any evidence for such influence plus the low intercorrelations within zygosity groups make me pessimistic about the chances of success of such an attempt.

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