INTERNATIONAL JOURNAL OF PSYCHOLOGY, 2012, 47 (0), 1–7

# A study of the dynamics of sex differences in adulthood

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Studies of gender differences using primarily young individuals show that males, on average, perform better than females in physical activities but worse than females on tests of verbal abilities. There is however a controversy about the existence of these sex differences in adulthood. Our study used 1271 participants from four cultural backgrounds (Chinese, multi-generation Canadians, Indu-Canadians, and European-Canadians) divided in five age groups. We measured sex differences in the time required for participants to complete a lexical task experiment, and also assessed their verbal tempo and physical endurance using a validated temperament test (Structure of Temperament Questionnaire). We found a significant female advantage in time on the lexical task and on the temperament scale of social–verbal tempo, and a male advantage on the temperament scale of physical endurance. These sex differences, however, were more pronounced in young age groups (17–24), fading in older groups. This "middle age–middle sex" phenomenon suggests that sex differences in these two types of abilities observed in younger groups might be "a matter of age," and should not be attributed to gender in general. A one-dimensional approach to sex differences (common in meta-analytic studies) therefore overlooks a possible interaction of sex differences with age.

***Keywords:*** Sex differences; Age-related changes; Verbal and physical abilities.

Les études portant sur les différences entre les sexes utilisent principalement des jeunes et montrent que les hommes, en moyenne, fonctionnent mieux que les femmes à des activités physiques, mais moins bien à des tests d'aptitudes verbales. Il y a toutefois une controverse au sujet de l'existence de ces différences selon le sexe à l'âge adulte. Notre étude a utilisé 1271 participants issus de quatre milieux culturels (des Chinois, des Canadiens de vieille souche, des Canadiens de langue ourdoue et des Canadiens d'origine européenne) divisés en 5 groupes d'âge. Nous avons mesuré les différences liées au sexe par rapport au temps requis pour que les participants complètent une tâche expérimentale de travail lexical et nous avons également évalué leur tempo verbal et leur endurance physique à l'aide d'un test de tempérament validé (Structure of Temperament Questionnaire). Nous avons trouvé un avantage significatif pour les femmes en ce qui a trait au temps requis dans la tâche lexicale et à l'échelle de tempérament pour le tempo socio-verbal, mais un avantage pour les hommes sur l'échelle de tempérament d'endurance physique. Ces différences entre les sexes, cependant, ont été plus prononcées pour les groupes plus jeunes (17–24), disparaissant pour les groupes plus âgés. Ce phénomène « âge moyen – sexe moyen » suggère que les différences liées au sexe dans ces deux types d'aptitudes observées chez les groupes plus jeunes pourraient être « une question d'âge » et ne devraient pas être attribuées au sexe en général. Une approche unidimensionnelle des différences entre les sexes (courante dans les études méta-analytiques) ne prend donc pas en compte la possibilité d'une interaction des différences selon le sexe et l'âge.

Los estudios sobre las diferencias de género que han usado principalmente individuos jóvenes muestran que los varones, en promedio, se desempeñan mejor que las mujeres en las actividades físicas, pero peor que las mujeres en las pruebas de habilidades verbales. Hay empero una controversia acerca de la existencia de estas diferencias sexuales en la adultez. Nuestro estudio usó 1271 participantes de 4 orígenes culturales (chinos, canadienses de varias generaciones atrás, urdu-canadienses y europeo-canadienses), divididos en 5 grupos de edad. Medimos las diferencias sexuales en el tiempo requerido por los participantes para completar un experimento de tarea léxica, y también evaluamos su ritmo verbal y resistencia física mediante un instrumento validado de temperamento (el Cuestionario sobre la estructura del temperamento). Encontramos una ventaja significativa femenina en el tiempo empleado en la tarea léxica y en la escala

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http://www.psypress.com/ijp http://dx.doi.org/10.1080/00207594.2012.756981

de temperamento Ritmo socioverbal, así como una ventaja masculina en la escala de temperamento sobre resistencia física. Estas diferencias sexuales, sin embargo, se pronunciaron más en los grupos de edad joven (17–24), desvaneciéndose en los grupos mayores. Este fenómeno de "media edad – medio sexo" sugiere que las diferencias sexuales en estos dos tipos de habilidades observadas en los grupos más jóvenes podría ser "un asunto de la edad", y no debería atribuirse al género en general. Una aproximación unidimensional a las diferencias sexuales (común en los estudios metanalíticos) ignora por consiguiente una posible interacción de las diferencias sexuales con la edad.

Studies of sex differences of various abilities often contradict common beliefs that such differences exist. Yet two types of abilities are among those few that consistently show sex differences: Men are thought to have more capacity for intense and prolonged *physical* activity (Bishop, Cureton, & Collins, 1987; Campbell & Eaton, 1999; Thomas & French, 1985), and women are thought to have better *verbal* abilities; i.e., higher fluency with words and better verbal memory, verbal analogy, spelling, language-related reasoning and in naming objects (Ellis et al., 2008; Hyde & Linn, 1988; McGuinness, Olson & Chapman, 1990; Shaywitz et al., 1995; Wagemaker, 1996). These sex differences appear at an early age (Campbell & Eaton, 1999), and are consistent with sex differences in preferences for games or toys in early childhood (Berenbaum & Snyder, 1995), even in nonhuman primates (Alexander & Hines, 2002). Browne (2002) cites US statistics describing jobs with a requirement for a single ability, either verbal or physical: Over 90% of bank tellers, receptionists, registered nurses, and pre-school and kindergarten teachers are women, and over 90% of firefighters, mechanics, and pest exterminators are men.

There are, however, indications that *age* might be a factor in terms of sex differences in these abilities. A one-dimensional approach to sex differences ("yes" or "no" judgment about their existence) therefore oversimplifies, as it overlooks a possible interaction of sex differences with age. Males and females might have different timings of maturation of physical and verbal systems, which can be seen as sex differences, and in mature age these differences might level (Barbu, Cabanes, & Le Maner-Idrissi, 2011). Studies performed using children and teenagers showed an advantage of girls over boys in writing (Ellis et al., 2008) whereas studies on adults reported no sex differences in number of words produced in a day (Mehl, Vazire, Ramirez-Esparza, Slatcher, & Pennebaker, 2007), men being more dynamic writers than women (Mulac, Studley, & Blau, 1990), and having a better verbal fluency in terms of naming technical things or categories; however, on other types of verbal tasks (including noncategory verbal fluency), women outperformed men (Wiederholt, Cahn, Butters, & Salmon, 1993). The early onset of sex differences (i.e., prior to socialization), age-related fluctuation in physical and verbal abilities, greater male size, female ability for childbearing/nursing, and female sociability were linked to hormonal differences between them (Berenbaum & Snyder, 1995).

Our study focused on those characteristics previously found to be most sensitive to age (i.e., tempo of activity), and related to two abilities that were previously found to have profound biologically based sex difference: verbal tempo and physical endurance. The hypothesis of the study was that sex differences in tempo of processing verbal material and self-perceived physical endurance start to fade in concert with the fading of sex differences in hormonal regulation during the transition from the adolescence to young adulthood.

The alternative view suggests that sex differences are merely the product of social–cultural expectations and functional activities, and that these differences have nothing to do with age or biological abilities. If this "just culture-induced functional roles" view on sex differences is true, then we would not find any age-related changes during the period of hormonal transition from adolescence to young adulthood.

This study investigated, therefore, whether or not sex differences exist and change with age, and, if they do, at what age these changes start. Rare reports that compared physical and verbal abilities of middle-age groups showed that changes in these abilities might start in the 30s (Birren & Schaie, 1977). This study focused on the adult age groups related to those years when an individual goes through several dramatic shifts in functioning: from being at high school (17–19 years) and college (20–23), to career start (24–29), professional routines (30–39) and "mature settlement" (40–62).

In order to assess the possibility of a crosscultural universality of effects and an impact of functional activities on sex differences, the study was conducted in four cultures with different occupation–sex ratios: Chinese (Chi), multi-generational Canadians (MG-Can), Canadians with background in India and Pakistan (Indu), and Europeans (Euro). According to the World Development Indicators report from the World Bank (2004), in 2002 these four cultures had the following contrasts in the employment of women aged 15–64 years: Indu, 39–45%; Euro, 56–65%; MG-Can, 72%; Chi, 79.5%). The four cultures also differed in ratios between agricultural–industrial jobs (requiring physical strength) and service jobs, with

India and Pakistan having the highest bias towards agricultural jobs (44% of men, 73% of women vs. 36/18% in service jobs), Canada having a bias towards service jobs (33/11% vs. 64/87%), and China and European countries being in the middle (33–50/14–30% vs. 44–52/70–80%).

## METHODS

### Sample

There were 1271 participants, including 993 Canadian permanent residents or citizens with strong English skills, volunteers within the Great Toronto area (14%), undergraduate psychology students of McMaster University (80%) and Brock University (6%) (Southern Ontario), in five age groups (age1: 17–19 years old; age2: 20–23; age3: 24–29; age4: 30–39; age5: greater than 40) in the following cultural samples (all tested in English).

1. 445 Multi-generational Canadians (M/F = 109/336); aged 17–54 (age1: $N = 247$, $M \pm SD = 18.74 \pm 0.57$; age2: $N = 120$, $M \pm SD = 20.64 \pm 0.88$; age3: $N = 30$, $M \pm SD = 25.60 \pm 1.73$; age4: $N = 20$, $M \pm SD = 35.35 \pm 3.07$; age5: $N = 28$, $M \pm SD = 48.14 \pm 5.23$).
2. 238 Canadians of Indian–Pakistani background ("Indu-Canadians," M/F = 73/165), aged 17–54 (age1: $N = 115$, $M \pm SD = 18.34 \pm 0.75$; age2: $N = 47$, $M \pm SD = 21.23 \pm 1.11$; age3: $N = 25$, $M \pm SD = 25.44 \pm 1.64$; age4: $N = 19$, $M \pm SD = 34.37 \pm 2.79$; age5: $N = 32$, $M \pm SD = 49.34 \pm 4.81$).
3. 310 Canadians of European background (M/F = 77/233), aged 17–54 (age1: $N = 189$, $M \pm SD = 18.70 \pm 0.53$; age2: $N = 60$, $M \pm SD = 20.78 \pm 1.01$; age4: $N = 32$, $M \pm SD = 32.19 \pm 2.38$; age5: $N = 29$, $M \pm SD = 47.79 \pm 5.41$).
4. In addition, 278 Chinese participants (M/F = 115/163), 77% students (M/F = 92/121), were tested in Chinese language: 120 volunteers from Guangzhou Pearl River Piano Group Co. and students from the last grade of Guang Ya High School were tested in China, Guangzhou city, Guangdong province; 158 Chinese students and volunteers who had recently arrived in Canada were tested in Canada in Chinese language. The age of participants tested in Chinese language ranged from 17 to 59 (age1: $N = 100$, $M \pm SD = 18.69 \pm 0.66$; age2: $N = 69$, $M \pm SD = 21.13 \pm 1.16$; age3: $N = 50$, M ± SD = 25.32 ± 1.52; age4: $N = 27$, $M \pm SD = 34.19 \pm 2.88$; age5: $N = 32$, $M \pm SD = 47.00 \pm 5.63$).

### Procedure

The study was conducted in 1999–2006. Formal consent was obtained before the procedures and participants were debriefed about the nature of the procedures. Chinese participants used Chinese versions of methods, which went through well-documented back–forward translation. The commonality of words controlled for any advantages or differences in languages.

1. The *lexical task experiment* requires the estimation of 30 most common nouns using 60, six-point, well-known bipolar adjectives (scales) (such as warm–cold, soft–hard, interesting–uninteresting) (Trofimova, 1999) (Table S1 in supplementary online material). This experiment was previously found to correlate more with verbal tempo than with intellectual abilities (Trofimova, 2009). Each concept was presented on a computer monitor at the top of the screen along with each of the evaluating scales (1800 concept–scale pairs in total) placed horizontally with six degrees of freedom (positions "slightly," "somewhat," and "highly" to the right and to the left from the center, corresponding to the two poles of a bipolar scale). The time on this task was recorded. University students received a practicum credit for their participation. Chinese participants completed the task in Chinese, and other participants completed the task in English. Number of participants tested was 1300, but only 1271 records were accepted (some records were incomplete, or had a pattern of answers such as 35353535).
2. The *Structure of Temperament Questionnaire (STQ)* (Rusalov & Trofimova, 2007): the English version was given to MG-Canadians, Indu-Canadians, and Euro-Canadians, and the Chinese version was given to Chinese. The validation history and psychometric properties of all versions of the STQ can be found in Rusalov and Trofimova (2007) and in Trofimova (2010): Studies showed that both versions had the consistent factor structure. The STQ has 150 items, assigned to 12 temperament scales (12 items per scale), and a validity scale (six items), in the Likert scale format: "strongly disagree (1)," "disagree (2)," "agree (3)," "strongly agree (4)." The scales are as follows (α values for both English and Chinese versions of the STQ are given based on the data in this study).

   ~~1.~~1–3 *Scales of Motor, Social and Intellectual Endurance* ("Ergonicity") (ERM, ERS, ERI),

**TABLE 1**
ANOVA effects in time spent on the lexical–semantic task (TimeST), in the scores of social–verbal tempo (TMS) and physical endurance (ERM), as measured by the STQ in four samples

| | *MG-Can* | | | *Indo-Can* | | | *Euro-Can* | | | *Chinese* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sex* | $F(1, 443)$ | $p$ | $\eta^2$ | $F(1, 236)$ | $p$ | $\eta^2$ | $F(1, 308)$ | $p$ | $\eta^2$ | $F(1, 276)$ | $p$ | $H^2$ |
| TimeST | 14.97 | .00 | .03 | 2.25 | .00 | .01 | 8.85 | .00 | .03 | 12.49 | .00 | .04 |
| TMS | 5.41 | .02 | .02 | 0.02 | .89 | .00 | 14.66 | .00 | .05 | 6.14 | .01 | .02 |
| ERM | 8.91 | .00 | .02 | 18.13 | .00 | .07 | 11.10 | .00 | .04 | 6.50 | .01 | .02 |
| *AgeGr* | $F(4, 440)$ | $p$ | $\eta^2$ | $F(4, 233)$ | $p$ | $\eta^2$ | $F(3, 306)$ | $p$ | $\eta^2$ | $F(4, 273)$ | $p$ | $\eta^2$ |
| TimeST | 30.98 | .00 | .22 | 19.35 | .00 | .25 | 15.71 | .00 | .13 | 20.85 | .00 | .23 |
| TMS | 0.98 | .42 | .01 | 5.56 | .00 | .09 | 9.14 | .00 | .08 | 8.29 | .00 | .11 |
| ERM | 2.99 | .02 | .03 | 0.30 | .87 | .00 | 3.71 | .01 | .04 | 0.89 | .47 | .01 |
| *Sex* × *AgeGr** | $F(9, 435)$ | $p$ | $\eta^2$ | $F(9, 228)$ | $p$ | $\eta^2$ | $F(7, 302)$ | $p$ | $\eta^2$ | $F(9, 268)$ | $p$ | $\eta^2$ |
| TimeST | 17.85 | .00 | .02 | 10.83 | .00 | .03 | 10.08 | .00 | .01 | 12.03 | .00 | .02 |
| TMS | 2.83 | .00 | .02 | 3.12 | .00 | .02 | 9.22 | .00 | .03 | 6.61 | .00 | .06 |
| ERM | 3.00 | .00 | .02 | 3.31 | .00 | .03 | 2.81 | .01 | .01 | 2.75 | .00 | .05 |
| All | Sex, *d.f.* = 1 | | | AgeGr, *d.f.* = 3 | | | Culture,§ *d.f.* = 3 | | | Sex × AgeGr, *d.f.* = 3 | | |
| sample | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ |
| TimeST | 12.85 | .00 | .01 | 88.36 | .00 | .19 | 1.01 | .39 | .00 | 6.15 | .00 | .01 |
| TMS | 4.55 | .03 | .00 | 16.41 | .00 | .04 | 18.07 | .00 | .05 | 4.60 | .00 | .01 |
| ERM | 7.96 | .00 | .01 | 7.23 | .00 | .02 | 14.02 | .00 | .04 | 5.36 | .00 | .01 |

MG-Can = multi-generation Canadians; $\eta^2$ = effect sizes. *$F$ for test of SS whole model vs. SS residual. §No significant interaction effects were found for Culture with other variables.

assessing the ability of an individual to sustain prolonged physical ($\alpha_{Eng} = 0.83$, $\alpha_{Chi} = 0.72$), social ($\alpha_{Eng} = 0.83$, $\alpha_{Chi} = 0.76$), or mental ($\alpha_{Eng} = 0.73$, $\alpha_{Chi} = 0.79$) activity respectively.

~~2.~~4–6 *Scales of Motor, Social and Intellectual Tempo* (TMM, TMS, TMI) assessing the speed of manipulations with objects ($\alpha_{Eng} = 0.72$, $\alpha_{Chi} = 0.73$), tempo of verbal activity (such as talking and reading) ($\alpha_{Eng} = 0.75$, $\alpha_{Chi} = 0.71$), and tempo of performing intellectual tasks ($\alpha_{Eng} = 0.70$, $\alpha_{Chi} = 0.73$) respectively.

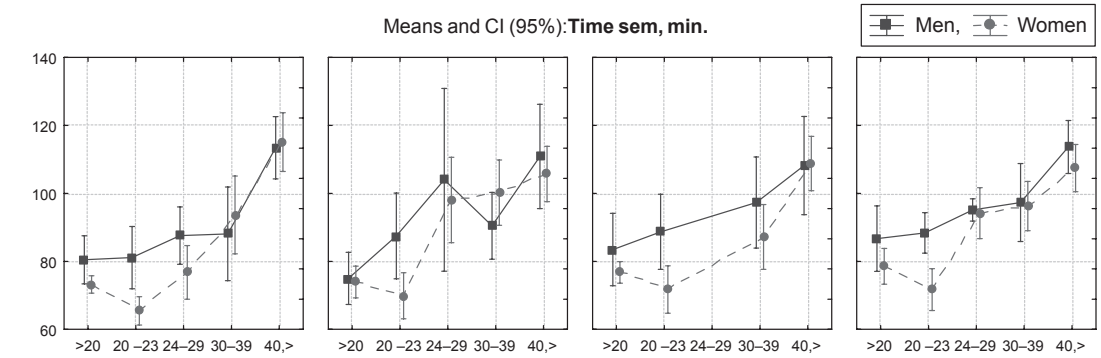
~~3.~~7–12 *Scales of Motor, Social and Intellectual Plasticity* (PLM, PLS, PLI) and *scales of Motor, Social and Intellectual Emotionality* (EMM, EMS, EMI) (not reported here; see the supplementary online material for details).

In each sample a 2(Sex) × 5(Age Group) analysis of variance (ANOVA) was performed for the time spent on the Lexical–Semantic Task (TSem) and the STQ scales as dependent variables. A factorial ANOVA for 2(Sex) × 4(Age Group)[1] × 4(Culture) was also performed for these dependent variables This study was focused primarily on the social–verbal tempo and physical endurance, therefore the results related to only these two STQ scales are reported in the main text. The data were processed using Tukey post-hoc comparison criteria for unequal samples, which is the most conservative method in such situations. The effect sizes were assessed with partial $\eta^2$ indicator, as comparison was done on more than two contrast groups of unequal sizes.

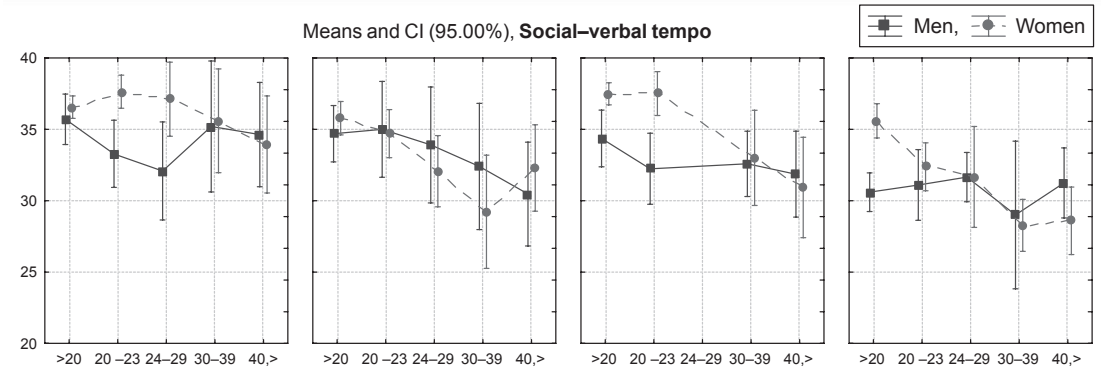
## RESULTS

Sex differences on these measures showed significant univariate main effects in ANOVA, with a female advantage in tempo of completing the lexical task across all four samples, and in the scores on the scale of tempo of social–verbal activity as measured by the STQ across three samples (Table 1, Figure 1). A male advantage was significant on the scores of physical (motor) endurance of the STQ. In terms of cross-cultural differences, a factorial ANOVA for Sex × Age Group × Culture showed almost no significant effects in interaction of Culture with Sex, Age Group, and Sex × Age Group on three dependent variables (with an exception of three-way interaction effect $F(9, 1134) = 2.05$, $p = 0.03$ for social–verbal tempo). Without a subsequent analysis of age dynamics one could argue that these results were consistent with previous studies and commonly held beliefs that men are more physically advanced and women are faster manipulators of words.

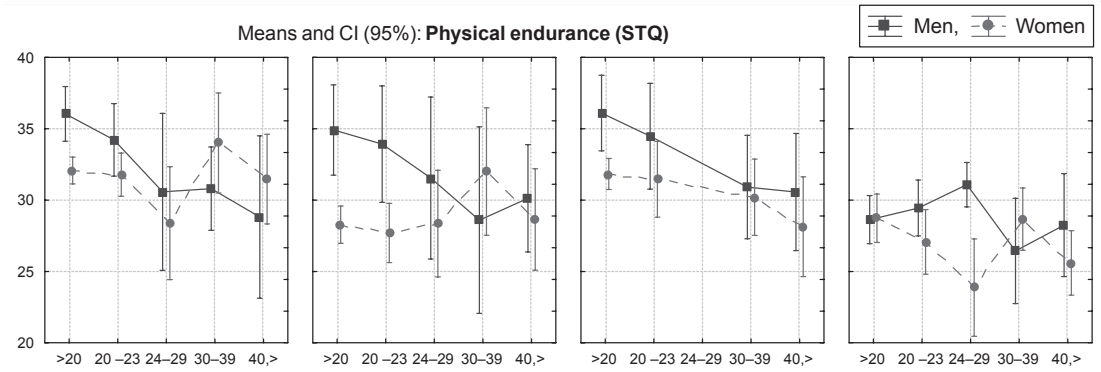
[1]Due to the absence of Age Group 3 in the Euro-Canadian sample, only Age Groups 1, 2, 4, and 5 were compared in this factorial ANOVA.




| | MG–canadians | Indu–canadians | Euro–canadians | Chinese |
|---|---|---|---|---|
| 19,< | .078 | .862 | .232 | .176 |
| 20-23 | **.003** | **.024** | **.017** | **.000** |
| 24-29 | .086 | .658 | N/A | .813 |
| 30-39 | .489 | .136 | .239 | .880 |
| 40,> | .805 | .528 | .939 | .273 |




| | MG–canadians | Indu–canadians | Euro–canadians | Chinese |
|---|---|---|---|---|
| 19,< | .481 | .500 | **.015** | **.000** |
| 20-23 | **.003** | .875 | **.001** | .407 |
| 24-29 | **.027** | .410 | N/A | .996 |
| 30-39 | .879 | .255 | .867 | .755 |
| 40,> | .794 | .427 | .678 | .173 |




| | MG–canadians | Indu–canadians | Euro–canadians | Chinese |
|---|---|---|---|---|
| 19,< | **.005** | **.000** | **.017** | .954 |
| 20-23 | .174 | **.011** | .236 | .158 |
| 24-29 | .519 | .322 | N/A | **.000** |
| 30-39 | .129 | .365 | .760 | .307 |
| 40,> | .389 | .557 | .344 | .217 |

**Figure 1.** Means and CI(0.95) of the time spent on the lexical task (TimeSem, min), and scores of social–verbal tempo and physical endurance as measured by the STQ. The tables under each plot indicate the significance of sex differences in post-hoc comparisons using Tukey HSD, analyzed for each age group.

The split into age groups, however, showed that this impression might be valid only for the younger age groups, especially for ages 20–23. Sex–Age Group interaction in Time on Lexical Task had significant (at $p < .001$) ANOVA effects in all four samples. Post-hoc comparisons based on Tukey HSD for unequal samples showed that a significant gap between men and women in the age group of 20–23 (with females spending less time in verbal manipulations than males) was closing after age 24. A univariate effect of Age Group on Time in the lexical task was significant in all four samples, showing the slow-down in time on this task with age (Figure 1, Table 1, Table S2). Similar effects were received in scores on the STQ scale of Social Tempo: by-age analysis revealed the reduction of sex differences after age 29.

Male superiority in the scores of physical endurance appeared to be also age-dependent and was statistically significant only at ages before 30, according to the post-hoc ANOVA comparisons. In three cultures sex differences in the scores of physical endurance showed a flip to female superiority at age 30–39; i.e., women reported higher physical strength than men (Figure 1, Table 1, Table S2 in supplementary online material).

## DISCUSSION

Overall our results showed a significant reduction of sex differences by age 30 in two biologically based abilities: verbal tempo and estimated own physical strength. Moreover, the reduction of sex differences was not symmetric: One gender group shows a significant deviation in the younger age groups from the overall mean across age groups, regressing toward the mean with increasing age, whereas the other gender group shows much smaller fluctuations about the mean.

The possible leveling of sex differences in physical and verbal abilities after age 25 (some sort of "middle age–middle sex" effect) and the early onset of these differences and toy preferences in childhood suggest a strong contribution of a biological factor working through hormonal mechanisms. The environmental explanation of the leveling of sex differences in two types of abilities would underline an impact of equal standards, training, and expectations for men and women. The environmental perspective, however, does not explain presocialization onset of these differences, or why the same standards for boys and girls in school settings do not produce a leveling of sex differences in verbal and physical abilities until the college years.

In summary, we argued that sex differences might be matter of age, in terms of verbal tempo and physical endurance. Our results suggest that after the peak in hormonal differences is over, extreme abilities might have a tendency to level out, regardless of functional tasks, training, or social pressure. Due to the correspondence between sex differences in abilities and hormonal patterns, the age-related dynamics in named abilities might be an example of how phylogenetic evolution can impact on ontogenetic development. If indeed the sex differences in studied abilities change with age, they should not be attributed to genders in general, which is common for the one-dimensional approach used in meta-analytic studies and social practices.

In terms of limitations, our study was primarily focused on subtle age-related changes in youth and the middle-age group. It is likely that with larger samples of "early professionals," "mature," and elderly groups, other statistically significant differences might be found.

Manuscript received 3 October 2011
Revised manuscript accepted 27 November 2012
First published online month/year

**Acknowledgements**

The author would like to thank Ann Hollingshead for making this study possible, and our students for administration of the methods: Kristine Espiritu, Chandrima Bandyopadhyay, Samira Patel, Vanita Marques, Iris Wen Wen, Doreen Wing Han Au, Ambreen Tahir, Azfar Ahmad Tahir, and Jennifer Bossio.

## REFERENCES

Alexander, G. M., & Hines, M. (2002). Sex differences in response to children's toys in nonhuman primates. *Evolution and Human Behavior*, *23*, 467–479.

Barbu, S., Cabanes, G., & LeManer-Idrissi, G. (2011). Boys and girls on the playground: Sex differences in social development are not stable across early childhood. *PLoS One*, *6*(1), e16407.

Berenbaum, S. A., & Snyder, E. (1995). Early hormonal influences on childhood sex-typed activity and playmate preferences: Implications for the development of sexual orientation. *Developmental Psychology*, *31*, 31–42.

Birren, J. E., & Schaie, K. W. (1977). *Handbook of the psychology of aging*. New York, NY: Reinhold.

Bishop, P., Cureton, K., & Collins, M. (1987). Sex difference in muscular strength in equally-trained men and women. *Ergonomics*, *30*, 675–687.

Browne, K. R. (2002). *Biology at work: Rethinking sexual equality*. New Brunswick, NJ: Rutgers University Press.

Campbell, D. W., & Eaton, W. O. (1999). Sex differences in the activity level of infants. *Infant and Child Development*, *8*, 1–17.

Ellis, L., Hershberger, S., Field, E., Wersinger, S., Pellis, S., Geary, D., et al., (2008). *Sex differences: Summarizing more than a century of scientific research*. New York, NY: Psychology Press.

Hyde, J. S., & Linn, M. C. (1988). Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin*, *104*, 53–69.

McGuinness, D., Olson, A., & Chapman, J. (1990). Sex differences in incidental recall for words and pictures. *Learning and Individual Differences*, *2*, 263–285.

Mehl, M. R., Vazire, S., Ramirez-Esparza, N., Slatcher, R. B., & Pennebaker, J. W. (2007). Are women really more talkative than men? *Science*, *317*, 82.

Mulac, A., Studley, L., & Blau, S. (1990). The gender-linked language effect in primary and secondary students' impromptu essays. *Sex Roles*, *23*(9/10), 439–470.

Rusalov, V., & Trofimova, I. (2007). *Structure of temperament and its measurement*. Toronto, Canada: Psychological Services Press.

Shaywitz, B., Shaywitz, S., Pugh, K., Constable, T., Skudlarski, P., Fulbright, R. K., et al., (1995). Sex differences in the functional organization of the brain for language. *Nature*, *373*, 607–609.

Thomas, J. R., & French, K. E. (1985). Gender differences across age in motor performance: A meta-analysis. *Psychological Bulletin*, *98*(2), 260–282.

Trofimova, I. (1999). How people of different age, sex and temperament estimate the world. *Psychological Reports*, *85*(2), 533–552.

Trofimova, I. (2009). Exploration of the benefits of an activity-specific test of temperament. *Psychological Reports*, *105*, 643–658.

Trofimova, I. (2010). Exploration of the activity-specific model of temperament in four cultures. *International Journal of Psychology and Psychological Therapy*, *10*(1), 79–95.

Wagemaker, H. (Ed.). (1996). *Are girls better readers? Gender differences in reading literacy in 32 countries*. The Hague, The Netherlands: IEA.

Wiederholt, W., Cahn, D., Butters, N., & Salmon, D. (1993). Effects of age, gender and education on selected neuropsychological tests in an elderly community cohort. *Journal of the American Geriatrics Society*, *41*(6), 639–647.

The World Bank (2004). *World development indicators*. Washington, DC: The World Bank.