Authoritative parenting and the child's academic achievement:

a Meta-Analysis

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Abstract

Previous literature researched how certain types of parenting styles, especially authoritative parenting, may be more beneficial to the child in a variety of ways, as, for example, the child's physical and mental health or its substance use and delinquency. Therefore, this random effect meta-analysis focused on the direct effect of authoritative parenting on academic achievement of the offspring, with the prediction that authoritative parenting and academic achievement would correlate positively. Furthermore, the articles were tested on possible subgroups and publication bias. The two subgroups were tested with a Z-test and they differed by who completed the questionnaire regarding the parenting styles, namely, the child or the parents. The possible publication bias was tested with a cumulative forest plot, the Egger's test, the trim and fill method and the p-uniform method. The meta-analysis showed a statistically significant positive correlation between authoritative parenting and the academic achievement of the child, but with a high degree of heterogeneity. The subgroups did not significantly differ from each other, implying that it did not matter who reported the type of parenting, however, two other subgroups were visualized from the cumulative plot, which could explain the heterogeneity of the model to some degree. The publication bias analyses consistently reported little or no bias, but this could be due to the low number of articles included in the analysis. Future research should focus on different possible subgroups and include more articles in the meta-analysis, so to have more reliable analyses for publication bias.

Introduction

In current literature there are four leading parenting styles introduced by Baumrind in 1967, differing in the evaluation of demands from the parents and responsiveness of the child. Baumrind's frame only consisted of three established primary parenting styles, namely: authoritative, authoritarian and permissive. Subsequently, neglectful parenting was added by other researchers (Maccoby & Martin, 1983). These styles diverge among two axes, being responsiveness and demandingness (Figure 1). The responsiveness variable measures support, protection, acceptance and overall warmth of the parent towards the child, or lack thereof. Demandingness is measured by the parent's strictness, expectations, reaction for broken rules and the child's compliance (Arnett, 2013; Slater & Bremner, 2017). Permissive (or indulgent) parents are not demanding but show high responsiveness towards the child, on the other hand, neglectful parents score low on both variables. Authoritative and authoritarian parents are both high in demandingness, however, authoritative parents show high responsiveness towards the child, while authoritarian parents do not. Some characteristics of authoritative parents are: showing forgiveness for mistakes (Strassen Berger, 2011), encouraging independence (Bi, 2013) and providing explanations for punishments (Arnett, 2013). Research shows that authoritative parenting is related to more beneficial outcomes and is preferred compared to other parenting styles (Dor & Cohen-Fridel, 2010; Sahithya, Manohari & Vijaya, 2019), therefore, this meta-analysis further investigates the intensity and direction of the correlation between authoritative parenting and specifically the academic achievement of the child.

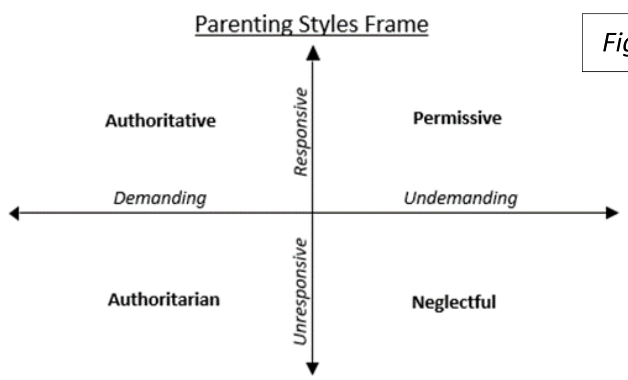

Figure 1

These four diverse parenting styles seem to affect the child in various aspects of life, among other things bad parenting can translate into problems in mental health (Dwairy, Achoui, Abouseriee &Farah, 2006; Uji, Sakamoto, Adachi & Kitamura, 2014) or physical health, such as obesity (Rhee, Lumeng, Appugliese, Kaciroti & Bradley,2005; Olvera & Power, 2009). The different styles have a likewise effect on the offspring's substance use and delinquency (Bronte-Tinkew, Moore & Carrano, 2006), or problematic behaviour (Aunola & Nurmi, 2005). Lastly and most importantly for this research, they seem to predict academic performance from kindergarten through college (Boon, 2007; Glasgow, 1997; Kim & Calzada, 2018, McBride-Chang & Chang, 1998; Mounts & Steinberg, 1995). Furthermore, because children are shaped by their parents in various forms throughout their childhood, academic achievement could also be mediated by other factors, such as self-efficacy (Masud, Ahmad, Jan & Jamil, 2016), however, the possible indirect effects will not be of focus in this research.

Various studies, including Kim et al. (2018) or Parra et al. (2019), indicated that authoritative parenting might be most beneficial for the child. Authoritative parenting might also benefit the child in regards of academic achievement and, as previously mentioned, there is a lot of research, but each research has its own focus and methodology. For example, Mounts and Steinberg (1995), included authoritative parenting only as a moderator to anticipate the influence of a friend's GPA and drug use, on the participant's drug usage and GPA. To evaluate their data, the researchers did regression analyses and t-tests. On the other hand, Weiss and Schwarz (1996), used Structural Equation Modelling to analyse the direct effect of authoritative parenting style on academic achievement. The results derived through different methods used in the studies need to be summarized and compared so that they eventually it is possible to visualize their importance and findings, this can be accomplished through a meta-analysis.

Therefore, this paper displays a statistical meta-analysis on articles that focused on the direct correlation between authoritative parenting and academic achievement, for which a subgroup analysis was performed, and the literature was tested for publication bias. We pose the question whether authoritative parenting has a significant effect on academic achievement and hypothesized that authoritative parenting would have a positive effect on the grades of the child.

Method

Literature Search

To answer the question whether authoritative parenting has a significant effect on academic achievement, the PsycINFO database was used. This database was accessible through the Tilburg University VPN and it encompasses articles in the field of behavioural science and mental health. The keywords entered in the search string were (*Figure 1)*:

(Parenting styles or authoritarian parenting or authoritative parenting or permissive parenting or neglectful parenting)

AND (grades or academic performance or academic achievement)

AND (teenagers or adolescents or teens or youth or emerging adults or high school)

AND (GPA or grade point average or academic achievement or academic performance) *

NOT (meta-analysis or systematic review or literature review)

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*we entered academic performance/achievement twice because we were looking especially for GPA scores in the articles that researched academic performance/achievement.

The search string was not filtered for a selected field, as can be seen in *Figure 1*. Therefore, later on, the search was reconducted to analyse whether there would be a significant change of relevant results for the meta-analysis, if the field option had been “TX All Text” or “SU Subject”. The search string yielded in both cases similar relevant articles results to the initial not filtered search string. Therefore, the articles chosen for the meta-analysis were only retrieved from the first search string, which had no a selected field.

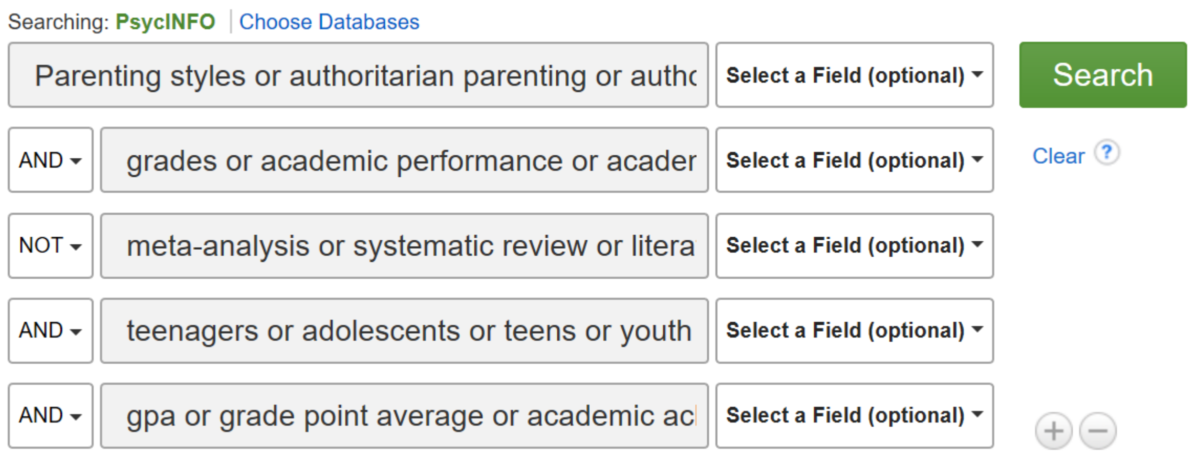

Figure 1. Displays the search string used to retrieve the articles.

Selection Criteria

The aforementioned search string yielded 295 results on the 24th of October 2019, see flow chart (*Figure 2)*. This considerable number of articles was subsequently filtered by ticking the boxes “Peer reviewed” and “Linked full text availability”, the publication dates of the 52 found articles ranged from 1986 to the year 2018. Eventually, only articles that described an influence of the parenting styles on the academic achievement of children were selected for the meta-analysis of this research paper by reading the abstracts and looking at the results tables. Fourteen articles described the relation between authoritative parenting and academic achievement and three additional articles were retrieved from the references of the previously found articles. However, only five articles with a total of seven studies were suitable for the meta-analysis, which were named: Garcia (Garcia & Gracia 2009), Smetana

(Smetana & Ahmad 2018), Assadi (Assadi, Zokaei, Kaviani, Mohammadi et al., 2007), Chao1, Chao2 and Chao3 (Chao 2001) and Turner (Turner, Chandler & Heffner 2009). The study of Chao (2001) was split into three different studies because the sample was composed of three distinct independent groups that were analysed separately from each other. The seven studies all measured parenting styles through questionnaires, and academic achievement through grades as, GPA or final exams. Some articles were excluded because of feasibility constraints, because they withheld relevant information to calculate the corresponding effect sizes, even though these had researched the correct effect. For example, two articles that displayed their results by calculating the mean GPA for each parenting style, did not report the standard deviations of each group (Weiss & Schwarz, 1996; Steinberg, Lamborn, Darling, Mounts et al., 1994). Or, studies computing regression analyses did not have a reasonable comparison group to contrast authoritative parenting with. Such as, Dornbusch, Ritter, Leiderman, Roberts, et al. (1987), who did not specify the null model nested in the regression of authoritativeness on the academic achievement of the child. As a result of these missing information, we would have had to make additional unreliable assumptions, which would have made this analysis more prone to researcher bias and could have further augmented the heterogeneity of the meta-analysis.

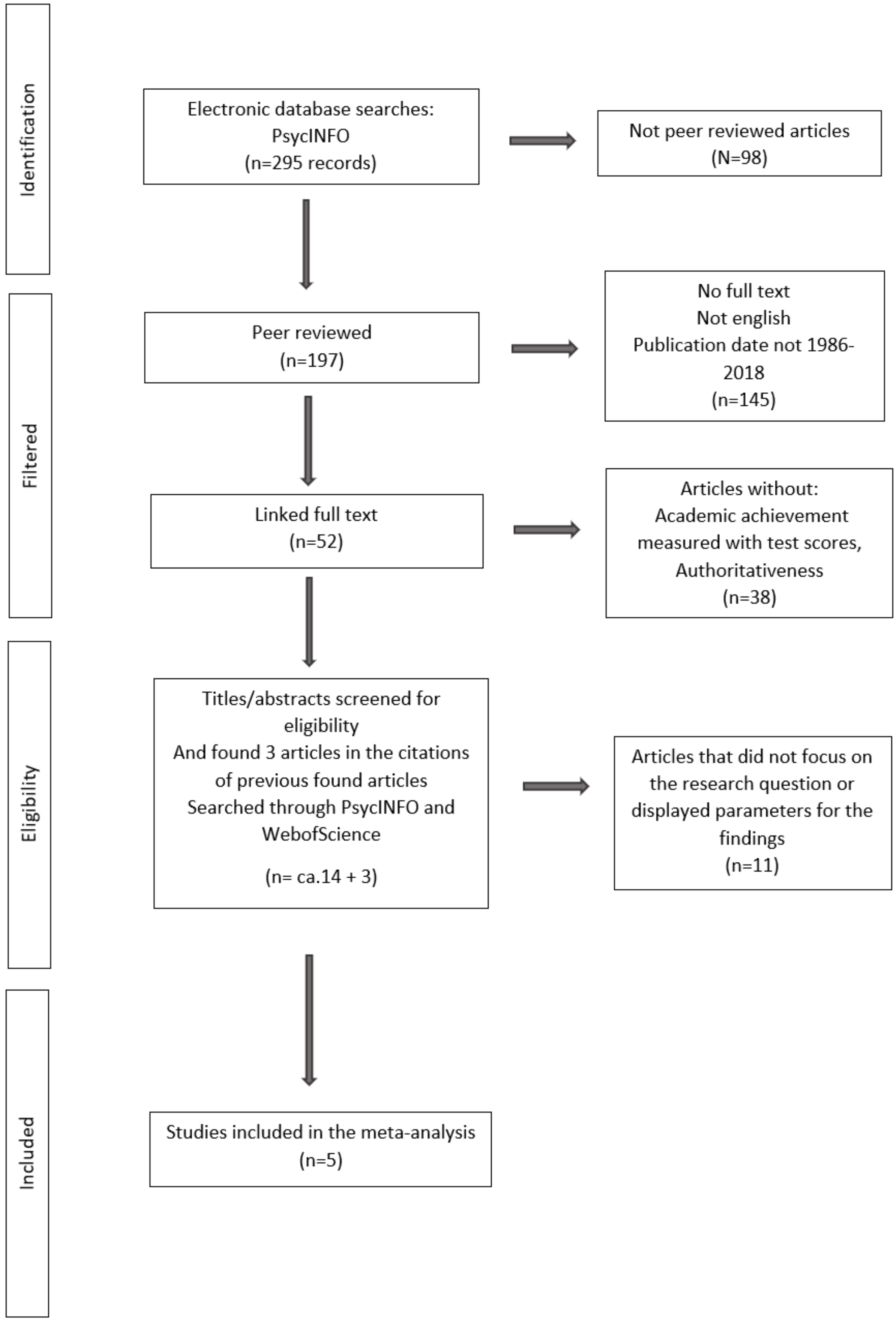

Figure 2. Flowchart of the selection procedure for the relevant articles.

Data Preparation and Effect Size Retrieval

The five included articles displayed their results in two different ways, they either represented the results in correlations or mean, both were eventually transformed into Fishers z, using the equations from Borenstein, Hedges, Higgins and Rothstein, (p.41-48, 2009). More specifically, the first type of articles presented the means of GPA under each of the diverse parenting styles, as authoritative, indulgent, neglectful and authoritarian (Garcia, 2009) and the second type of articles directly presented correlations. From the results illustrated through means it was not possible to directly retrieve a group to contrast authoritative parenting with. Therefore, a comparison group was estimated by averaging out the means and pooling the standard deviations of the non-authoritative parenting styles, such as authoritarian, permissive and neglectful parenting. The remaining articles displayed their results quantifying through correlation the effect between authoritativeness and academic achievement, which was mostly operationalized through GPA but also through a final grade (Assadi et al. 2007). First, the corresponding effect sizes of each study were calculated. To determine the effect sizes based on means, for each group, the raw means, the sample size and the respective standard deviations were retrieved. With this data, the standardized mean differences (d), *Equation 1,* and their variances (Vd), *Equation 2,* were calculated.

Equation 1
$$d = \frac{Xm1 - Xm2}{Spooled}$$

Equation 2
$$Vd = \frac{n1+n2}{n1 \times n2} + \frac{d^2}{2(n1+n2)}$$

Where the X_{m1} and X_{m2} indicated the means of the GPA on authoritative parenting and its comparison group, with the respective number of participants labelled as n_1 and n_2. S_{pooled} was based on the assumption that the standard deviations of the two populations were the same ($\sigma1=\sigma2$) (*Equation 3*).

Equation 3 $$Spooled = \sqrt{\left(\frac{(n1-1)\times S1^2+(n2-1)\times S2^2}{n1+n2-2}\right)}$$

The standardized values were later on transformed into a correlation, *r,* (*Equation 4*) and its variance, V*r*, (*Equation 5)*, consecutively also the articles that displayed their results with correlations were included.

$$a = \frac{(n1+n2)^2}{n1 \times n2}$$

Equation 4 $$r = \frac{d}{\sqrt{(d^2+a)}}$$

Equation 5 $$Vr = \frac{a^2 \times Vd}{(d^2+a)^3}$$

Each study's Fisher's z value was calculated from the correlations (*r*) (*Equation 6),* with their respective variance (*Equation 7),* here the n stands for the total sample size of the study, so n_1+n_2. These values, among others, were calculated in excel and later on imported into R (Version: 3.5.1; R Core Team) and analysed.

Equation 6 $$z = 0.5 \times \ln\left(\frac{1+r}{1-r}\right)$$

Equation 7 $$Vz = \frac{1}{n-3}$$

The overall fisher's Z and its confidence interval were transformed back to a Pearson's correlation to make the results more intelligible. (*Equation 8 and 9).*

Equation 8 $$r = \frac{e^{2z}-1}{e^{2z}+1}$$

Equation 9 $$z\ (Lower\ and\ upper\ limit) = Fz \pm SE(Fz) * 1.96$$

Analyses of Effect Sizes

Once the comma divided excel dataset was imported to R (RStudio Team, 2016), we performed a random effect meta-analysis, using the R package "metafor" (Version:3.5.1; Viechtbauer, 2010). The random effect model acknowledges a distribution of the true effect sizes, unlike the fixed effect model, which assumes one true effect size through all the studies. The random effect model furthermore allows for samples to derive from disparate populations, and therefore, would need more data to yield the same statistical power as a fixed effect analysis. We decided not to use the fixed effect model because the studies had major discrepancies, for instance, each research differed in regards to, ages and ethnicities of the participants, different definite sample sizes and the study design, so we inferred that the true effect sizes were not equal. However, the studies had enough in common to compute a meta-analysis and therefore, applied the random effect model and assumed the true effect sizes to be normally distributed.

To assess whether the reported studies had the same underlying population effect size, the assumption of heterogeneity was tested with Cochran's Q. The null hypothesis of this test states that all studies share a common effect size. However, this measurement will have low power because the number of included studies is very small. Based on Q we estimated the variance of the true effect sizes, also called between study variance (Tau^2) which was then used to appoint weights to each study. Additionally, the ratio between total heterogeneity and total variability of the observed effects (I^2) was measured, which shows the percentage of observed variance that is due to heterogeneity rather than chance.

Subgroup Analysis

Furthermore, to examine a possible interaction effect between study characteristics and parenting styles on academic achievement, a sub-groups analysis was conducted. As mentioned before all the studies measured the parenting styles through questionnaires, however, in two studies (Smetana 2018; Garcia 2009) the children described the parenting styles, while the other studies asked a self-report from the parents. This should be taken into account, because children might perceive the parenting styles different compared to a parent. The children might believe their parents are stricter than they actually are and describe them as more authoritarian rather than authoritative, this could result in a lower correlation between authoritativeness and academic achievement. Therefore, these two subgroups were analysed through hypothesis testing for significant differences in their results. The null hypothesis stated that the means of the two subgroups did not differ significantly. First, two separate meta-analyses were “calculated”, meta-analysis A included the studies in which the children answered the questionnaire and meta-analysis B included the studies in which the parents filled in the questionnaire. This was done in R (RStudio Team, 2016), which provided the means and confidence interval of the respective subgroups. The statistical difference between sub-groups was then compared with a Z-test, because there were only two sub-groups. The standard errors for these calculations were retrieved through the confidence interval and the mean of the meta-analysis A and B. Consecutively the Z value of the difference between the studies was calculated based on the ratio (*Equation 11*)of mean difference (*Equation 10)* and the standard error (*Equation 12)*, for further clarification, the used formulas can be found on p.176-177 in the book of Borenstein et al. (2009).

Equation 10

$$Diff^* = M_B^* - M_A^*$$

Equation 11

$$Z_{Diff}^* = \frac{Diff^*}{SE_{Diff^*}}$$

Equation 12

$$SE_{Diff^*} = \sqrt{V_{M_A^*} + V_{M_B^*}}$$

We did not compute a meta-regression, because, as explained by Harrer, Cuijpers, Furukawa and Ebert (2019), the meta regression would not be sensitive to variations between the groups, if the amount of data used for this process is too low. Since we do not have the information of the single participants of each study, but only measurements derived from them, the meta regression would have to be carried out a on the predictors study level. Borestein, Hedges et al. (2009) suggest using more than ten studies for each covariate and this meta-analysis only consist of seven studies.

Bias Analyses

The articles used for this meta-analysis were found through the Tilburg University library data bases, and were filtered for peer reviewed published journal articles, so the meta-analysis could be subject to the file drawer problem (Rosenthal, 1979). This is also called publication bias, which is the phenomenon that describes how results of studies might influence the chances of the articles getting published. This could mean that on one hand, non-significant findings might not get published, but on the other hand, studies that reaffirm previous findings do get published and create an overestimate effect of said findings.

Therefore, we used various methods to assess the publication bias, the total of missing studies and to insert a correction for bias. The first method, a cumulative forest plot, listed the studies from biggest sample size to smallest, displaying the gradual decrease of accuracy in the studies. Here if the overall effect size increased when adding less precise studies, showing a shift towards the bottom of the plot, in the summary data, could imply publication bias. The reason for this being that from the least precise studies, only the studies that showed a significant or big effect had been published and were subsequently used in the meta-analysis, studies such as the ones listed in the lower part of the cumulative plot, with a small sample size. In the second method we examined the funnel plot (Egger et al., 1997) by looking for possible asymmetry to have a subjective impression whether and where there could be missing research. The funnel plot displayed the studies standard error and the observed outcome.

Subsequently, by doing a Trim and Fill (Duval & Tweedie, 2000a, 2000b) with the "trimandfill()" function of R in the "metafor" package (Version:3.5.1; Viechtbauer, 2010) the data set was adjusted for variance fluctuations in order to display how the funnel plot would look like with an unbiased estimation effected size. This method removes the smaller studies that may cause asymmetry in the funnel plot, then recomputes the effect size and adds the missing studies to complete a symmetrical funnel plot.

We discarded older methods such as the fail-safe N (Rosenthal, 1979; Orwin & Boruch, 1983) approach, because it has a limited perspective in the analysis, the means of the absent studies are assumed to be zero and the method relies on a significance test that merges the p-values across studies.

A newer method to assess publication bias is by conducting a p-uniform analysis (van Assen, van Aert & Wicherts, 2015), it additionally estimates the effect size and calculates a hypothesis test of no underlying effect. This method has two assumptions, it assumes that each article with statistically significant results have the same chance of getting published and comprised into meta-analyses and it assumes a fixed true effect size between the studies. Even though this was a random effect model meta-analysis, we still used this method out of research purposes, to see if its results aligned with the other three methods and to test whether there might not even be an underlying effect to research for. These methods, apart from the fail-safe N approach, will be discussed more in details in the result section.

Results

From the literature search, five articles were retrieved for the meta-analysis, which comprised a total of seven studies. These studies analysed whether parenting styles correlated with the academic achievement of a child. The main variables of each study were synthesized in table 1. The table displays variables of demographic nature, the measurement of the dependent and independent variables, the type of results, sample size and the effect size. However, the more in-depth statistical variables, calculations and formulas, can be found in the attached excel file and R script. The articles were analysed through three major steps, first the summary of the studies was computed, also testing for heterogeneity. Secondly, the subgroup analysis was reported, in which two subgroups were tested for significant differences. The first subgroup consisted of the articles in which the children reported the parenting style, and the second subgroup of articles in which the parents reported their parenting style. Thirdly, the bias analysis was completed, here, forest, funnel plots and p-uniform were used to identify publication bias.

Table 1. Synthesis of the articles included in the meta-analysis.

Study ID	Author	Year	Country	Measurement of parenting	Measurement of academic achievement	School grade/Age	Type of result	Sample size	Effect size (Fisher's Z)	Standard error
Smetana	Smetana	2018	Jordan	Questionnaire for child	GPA	Adolescent	Means	530	0.681	0.041
Garcia	Garcia	2009	Spain	Questionnaire for child (WAS scale)	GPA	12-18 y.o.	Means	612	0.123	0.0436
Assadi	Assadi	2007	Iran	Questionnaire for parent (PAQ)	Final exam	9th grade	Correlation	240	0.121	0.065
Chao1	Chao	2001	US	Questionnaire for parent	GPA	9th -12th grade	Correlation	148	0.693	0.083
Chao2	Chao	2001	US	Questionnaire for parent	GPA	9th -12th grade	Correlation	176	0.202	0.076
Chao3	Chao	2001	US	Questionnaire for parent	GPA	9th -12th grade	Correlation	208	0.254	0.070
Turner	Turner	2009	US	Questionnaire for parent (PAQ)	GPA	Undergraduate	Correlation	264	0.131	0.062

Summary of the studies

The meta-analysis of the seven studies was carried out with a random effect model in R (Version: 3.5.1; R Core Team). The mean correlation of the meta-analysis is 0.31, with a 95% confidence interval ranging from 0.12 to 0.51, it does not include zero and the effect is therefore, statistically significant (r=0.3139, SE=0.0979, p=0.0013), however, most meta-analyses show statistically significant results because of the high degree of participants accumulated through the numerous studies included, which makes this information useless to some degree. The overall Fisher's z value and respective confidence interval were transformed back into raw correlations for interpretation purposes r=0.3004, $CI_{95\%}$ (0.12;0.46). We are 95% sure that the true effect lies in this confidence interval. However, the variety of possible correlations comprised in this interval is still very large, because, for example, a correlation of 0.1 is considered weak and 0.5 is interpreted as a moderated or even strong correlation in some cases. The random effect model was synthesized in a forest plot (Figure 3), where each row represented a study, apart from the last row, which displayed the summary of the model, including the study's effect size with the respective confidence interval. The random effect model computed Cochran's Q(6)=5.4254, p<0.0001. This test was significant, meaning that the null hypothesis was rejected for this analysis, and therefore, demonstrating a statistically significant difference in the variation of the true effects. The between study variance was estimated to τ^2=0.0630, SE=0.0387, and the proportion of the observed variance that reflects real differences in effect size (Borenstein et al. 2009), I2 = 94.85%.

The proportion of the observed variance that reflects real differences in effect size (Borenstein et al. 2009), I^2, resulted very high, meaning that the meta-analysis had a high degree of heterogeneity and the studies might have not extracted their samples from the same population. Therefore, a look should be taken into the subgroup analyses results.

Furthermore, Hak, Van Rhee and Suurmond (2016), imply that when I^2 is high, the total effect size of the meta-analysis should not be taken into consideration.

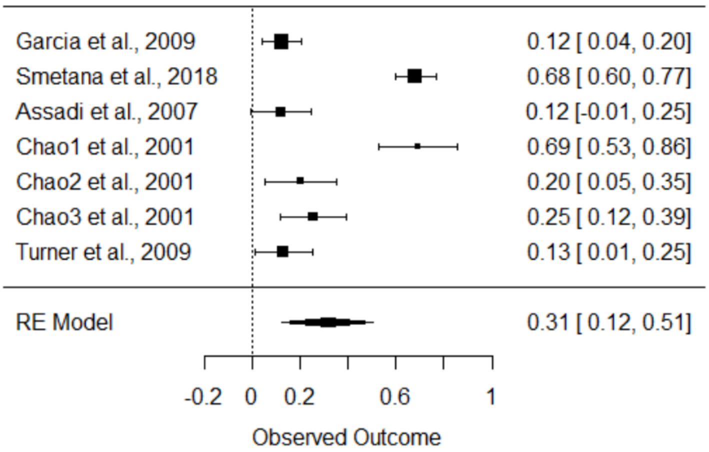

Figure 3. The random effect model, with study ID, year of publication, effect size and confidence interval

Subgroup analysis

Through a subjective analysis a priori of differences between the articles, we found that the parenting styles questionnaires were administered to either the parents or the child. Therefore, we performed a subgroup analysis, in which the studies were divided by who completed the questionnaire. One subgroup consisted of the studies in which the children reported the parenting style, which comprised the studies of Smetana et al. (2018) and Garcia et al. (2009). The other subgroup consisted of studies in which the parents self-reported their parenting style, they were respectively named subgroup A and B. The meta-analysis of subgroup A showed a summary with a mean of 0.4 and a standard error of 0.281. The meta-analysis for subgroup B synthesized a mean of 0.28 with a standard error of 0.102. The two meta-analyses were compared through a two-tailed Z-test (Borenstein, 2009, p.168), which showed, $Z_{diff} = 0.40$, $p=0.688$. The p-value indicates that the null hypothesis cannot be rejected, therefore, the z value of the difference of the means is not statistically significant.

Bias analysis

Assadi et al. (2007); Turner et al. (2009) and Chao (2001) all calculated statistically significant correlations between parenting styles and the grades of the child, which is more than 70% of the studies included in the meta-analysis. This number could be due to the file drawer problem described by Rosenthal (1979), which implies that studies that show significant effects may have a higher chance of getting published than studies that find non-significant results. This problem is also called publication bias, it is quite recurrent in published academic research, and if not controlled for, it can seriously influence important theoretical findings summarized through meta-analyses. Therefore, we conducted bias analyses to identify possible publication bias in the meta-analysis. First, the cumulative forest plot was estimated (*Figure 4),* where a drastic increase in overall effect size, identifiable by a big shift towards the right between the two most precise studies of the analysis Garcia et al. (2009) and Smetana et al. (2018). This initial increase or shift is followed by two smaller fluctuations in either directions. The study of Garcia et al. (2009) had the most precise but lowest observed effect, 0.12 with $CI_{95\%}$ (0.04; 0.02). When the second most precise study was added (Smetana et al., 2018), the observed outcome and its confidence interval became very big, 0.4 with $CI_{95\%}$ (-0.14; 0.95). The overall estimate of the rest of the studies varied with small shifts around 0.31. Overall there is a shift towards the right side of the plot, which would imply that the articles included in this meta-analysis might be subject of publication bias. However, if the study of Garcia et al. (2009) was excluded, the suspect of publication bias would diminish drastically, because most cumulative estimates slightly shifted to the left.

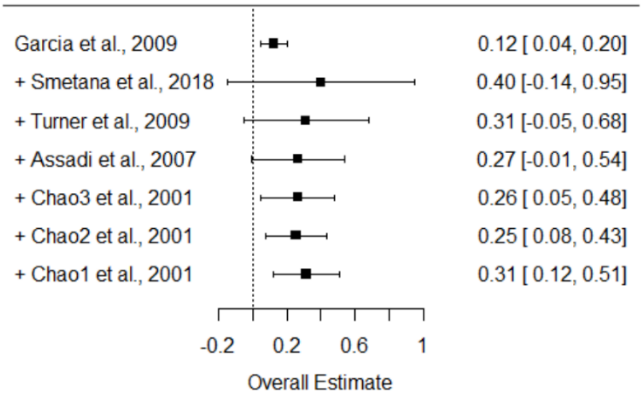

Figure 4. Cumulative forest plot

Second, the Egger et al. (1997) funnel plot (*Figure 5)* was computed, where the standard error was plotted against the observed outcome. Even though all studies have a positive observed outcome, only two studies seem to have a high observed outcome, higher than the mean, thus, the other five studies, which compensate the higher two, seem to influence the mean much less. Afterwards, we looked for vertical symmetry to indicate the absence of publication bias, because as Rothstein et al. wrote: “The more pronounced the asymmetry, the more likely it is that the amount of bias will be substantial” (Rothstein, Sutton & Borenstein, 2005). This funnel plot seems symmetrical, even though there are five studies that together weigh out only two studies.

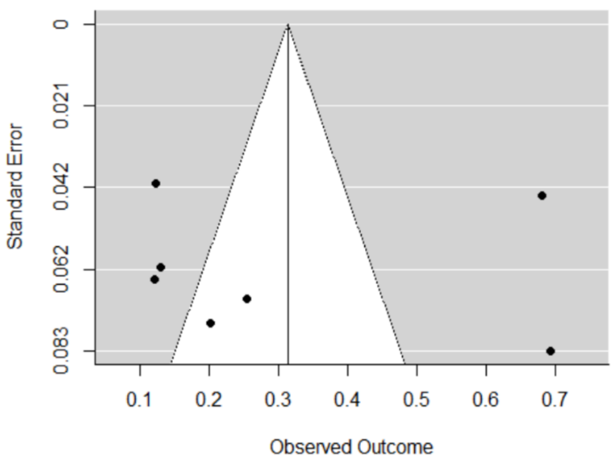

Figure 5. Egger’s funnel plot.

The third analysis to test for publication bias, the Trim and Fill method (Duval & Tweedie, 2000a, 2000b) was used. This procedure, which is computed in R (Version: 3.5.1; R Core Team), displays the best estimation of the unbiased effect size, while removing the smallest studies that may cause asymmetry and adding fictional studies that would rebalance the symmetry. The trim and fill method estimated zero missing studies, (Figure 6). The effect of these differences will be elaborated more in depth in the discussion section.

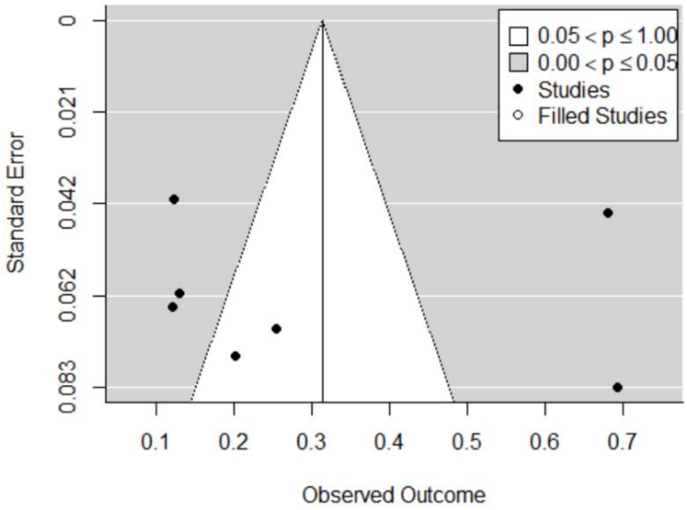

Figure 6. Funnel plot after the trim and fill method.

In conclusion, the p-uniform method was applied to estimate an adjusted effect size and publication bias, which we then compared to the other three publication bias analyses. The correlation estimate of the fixed effect meta-analysis was $r= 0.307$, $p<0.001$, which was almost equal to the result of the random effect model computed at the start. The adjusted Fisher z that p-uniform calculated was statistically significant with an estimate of 0.2116, which was almost 0.1 lower than the fixed and random effect size. Its publication bias test was not statistically significant ($L.pb=1.0854$, $p=0.1389$), and therefore these results comply with the outcomes of the previous analyses.

Discussion

This paper comprises a meta-analysis regarding the effect of the authoritative parenting style on the academic achievement of the child. We hypothesized that authoritative parenting would have a significantly positive effect on the grades of the child. The meta-analysis is based on seven studies. Each study measured the parenting style through a questionnaire. The dependent variable, academic achievement, was measured with the GPA score or the final exam grade. The meta-analysis yielded a significantly positive effect, implying that academic achievement positively correlated with the authoritative parenting style a child grew up with.

Summary of studies

The overall correlation of academic achievement and authoritative parenting was 0.31, which is considered a positive medium strength correlation. Therefore, the results suggest that authoritative parenting positively correlates to the academic achievement of the child. The random effect model calculated a statistically significant positive effect size; therefore, the null hypothesis was rejected for this analysis. Furthermore, because of this significant result we assume that the sample unlikely derived from a population with a null effect. From the confidence interval we can deduce with 95% assurance that the true effect is contained in the calculated interval.

The test for heterogeneity also showed a statistically significant effect, describing a significant difference in the variation of the true effects of the studies and consecutively supporting our choice on applying the random model. Even if the test for heterogeneity would not have been significant, switching to a fixed effect model would not have made much sense, because the model choice needs to be done a priori from the contextual theory.

Subgroup analysis

The Z-test (Borenstein, 2009, p.168) computed a non-significant effect, implying no statistically significant difference between the means of the two subgroups and therefore, not aiding the explanation of the heterogeneity of the meta-analysis. However, from the forest plot (*Figure 3)* we can find two new hypothetical subgroups, which are divided by the similarity of observed outcome between the studies. In this case, subgroup 1 would consist of the studies of Smetana et al. (2018) and Chao1 (Chao, 2001), while the rest would be clustered in group 2. These two subgroups might explain why heterogeneity analysis had a statistically significant outcome or the possible different populations from which the studies might have been sampled. We did not perform such analysis because the subgroup division was based on an a priori decision of substantial differences between the articles, however, future research might find the, not yet evident, difference between the studies of hypothetical subgroup 1 and 2.

Bias analysis

Overall, the meta-analysis seems to be statistically robust to publication bias, with little or no effect. In the cumulative forest plot (*Figure 4),* on average, there was a slight increase of overall correlation estimate, but this plot would imply only little publication bias. The second analysis for publication bias (*Figure 5),* Egger et al. (1997), displayed a quite symmetrical funnel plot, indicating no or little publication bias. However, the meta-analysis was based only on seven studies which could have yielded a symmetrical funnel plot just by chance, because the lower the study number the higher the chance is for them to be somehow symmetrical, for example, any three studies can be pictured as symmetrical with the right scale and perspective. The third analysis, the trim and fill method of Duval & Tweedie (2000a, 2000b), reported zero missing studies showing once again no evidence for publication bias. The last method used was the p-uniform, the fixed effect model and the random effect model had almost the same correlation estimate, but the standard error of the fixed effect model was way smaller than the random effect model. This could be due to the assumptions that were taken in order to conduct a fixed effect analysis, such as assuming that the true effect sizes were equal across studies. The effect size estimate p-uniform, shows the effect size corrected for publication bias; it overestimates the average effect size when there is heterogeneity in the true effect sizes, however, the effect size estimated through p-uniform resulted smaller than the random effect model effect size, this could be because p-uniform applies a fixed effect model to the analysis. The p-uniform result on the publication bias analysis was statistically not significant, and therefore, no significant amount of publication bias was estimated in the meta-analysis, which supports the results of the previous methods. Based on one meta-analysis we cannot conclude that the research of the developmental field on the correlation between academic achievement and authoritative parenting is or is not subject to publication bias.

Limitations

The biggest limitation of the meta-analysis conducted in this research paper is that only a few articles were included. Even though it contained all suitable articles, regarding the effect of authoritativeness on the academic achievement of the child, found in the database PsycINFO, more articles could probably be found in other databases, however, this was not possible due to time constraints. Analyses such as meta-regression could also not be performed due to the low amount of data (Borestein, Hedges et al. 2009). Furthermore, this meta-analysis only included studies that researched the direct effect between the dependent and independent variable, disregarding many more moderated and mediated studies that were conducted on this effect, which may explain the vast heterogeneity. These studies, for example, were used in the meta-analysis of Pinquart (2015), which additionally to the parenting style and the academic achievement, analysed the effects by regional differences.

The subgroups that were a priori defined did not show a significant difference, therefore, not explaining the heterogeneity of the model. After the subgroup analysis was conducted, from the forest plot, we could visualize two potential subgroups. However, a second subgroup analysis was not conducted because we could not define the differences and similarity of these two subgroups substantively and because the subgroups were not established beforehand.

The analyses used to detect possible publication bias were based on subjective evaluation, where, by definition, researchers might form differing conclusions from the same results. Therefore, we preferred to focus on the description of the results of these analyses without drawing drastic conclusions. Moreover, even though the publication bias analyses that were suggested by Borenstein et al. (2009) were used, these methods are still work in progress, which is why we decided to use four methods to compare the results to each other, in order to establish a better opinion. Furthermore, these analyses are mostly subjective and depend on the researcher’s decision criteria and use for the meta-analysis.

Another important point that needs to be mentioned, is that the final research question for this meta-analysis was only established during the literature search was conducted. Due to timing restrictions the sample of included articles had to be small, and we therefore had to specify the research question multiple times. However, this should not significantly affect the results of this meta-analysis.

Conclusion

The studies in the meta-analysis all shared the tendency of a positive correlation between authoritative parenting and the academic achievement of the child, implying that high responsiveness and demandingness from a parent can be beneficial to its academic achievement, also in theory this type of parenting seems the most favoured style. However, in real life it must be quite hard to distinguish which parenting styles most parents use and which ones are the most beneficial, because of its spectrum. Moreover, there is a variety of situations where parenting takes place that cannot be measured, therefore, parenting styles should not only be measured through questionnaires but also through other methods such as observation. Furthermore, this effect was found in various parts of the world, as the USA, Spain, Jordan and Tehran, but no study conducted in the eastern Asian countries was included in the meta-analysis. There, according to research of Stewart, Bond, Kennard, Ho and Zaman (2002), parenting is described with “Guan” (Stewart, Bond, Kennard, Ho & Zaman, 2002), describing the directiveness and control of the parents, which together with self-discipline and obedience taught to the child, is positively seen in their culture. In these countries, we speculate, authoritarian parenting could be the most efficient because teaching obedience might be closely connected to less warmth and therefore a lower emotional responsiveness towards the child, which are characteristic traits of authoritative parenting. Therefore, people should be educated on the different parenting styles, because different styles might work best for eastern cultures but other styles for western cultures, or more importantly, so that they can make an informed opinion about possible negative outcomes of styles as neglectful and permissive parenting.

On one hand, future research on this specific meta-analysis should focus on the subgroup analysis, to find out what could explain the high level of heterogeneity and the differences between the possible populations from which the participants were extracted. On the other hand, the bias analysis on the research question whether authoritative parenting style has an influence on academic achievement of the child should be done on meta-analyses that comprise more studies, such as the meta-analysis of Pinquart and Kauser, (2018). This study, for example, used a total of 428 studies, collected from four databases and also included internalizing and externalizing problems of the child. They also checked for publication bias through the Egger test and the trim and fill methods. However, these tests detected publication bias in their study, which considering the high amount of studies included, seems more reliable than the results of the meta-analysis of this paper.

In summary, this meta-analysis gave an insight to a possibly beneficial parenting style, specifically on the positive correlation between authoritative parenting style and academic achievement of the child. However, this effect should be tested in future research with bigger samples of studies included, more reliable statistical methods and contrasted to similar studies in different cultures.

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